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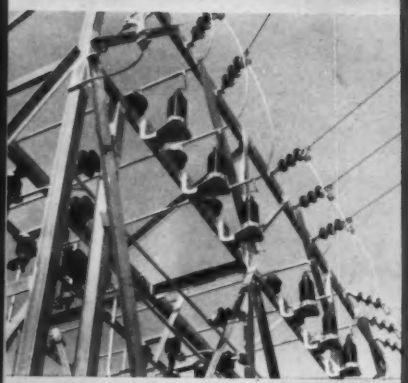
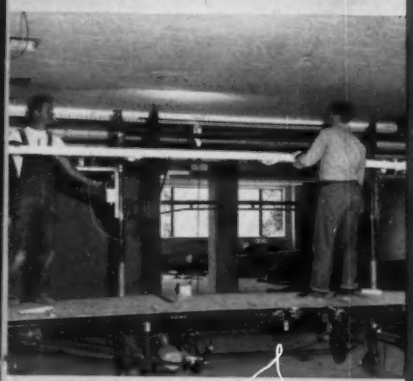


Aluminum Sub 78



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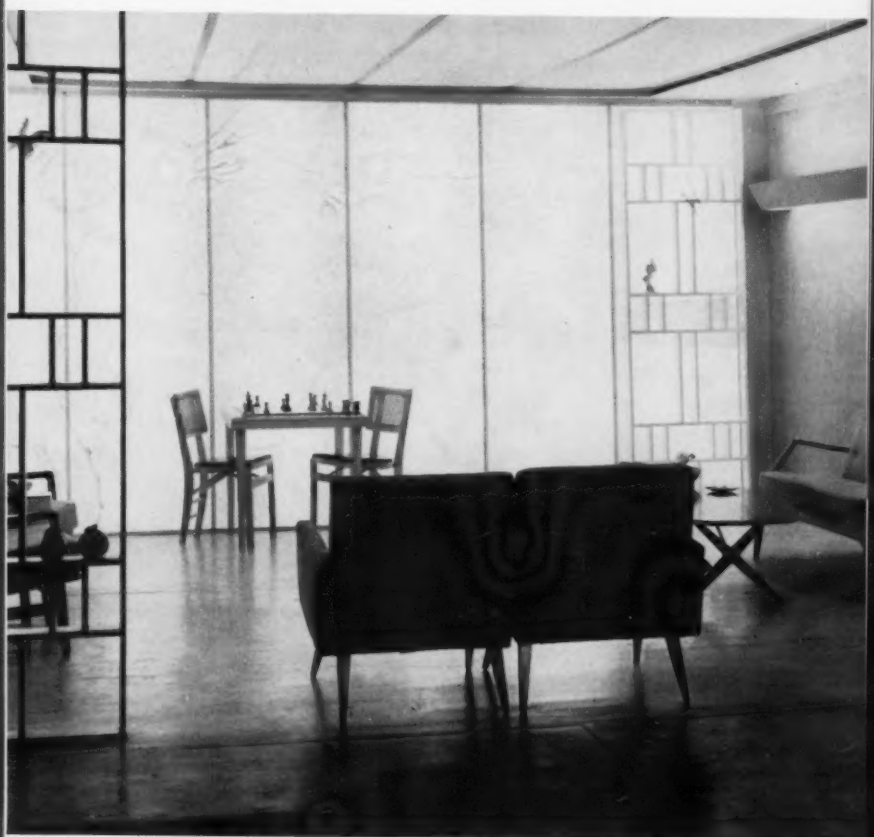
ELECTRICAL WEST

May 1956
25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.



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Survey Finds Remarriages Are Success

UNIVERSITY PARK, Pa. (AP) — A 5-year study of remarriages shows that they have the same chance for success as first marriages. . .

"go home" letters. Two programs will be conducted simultaneously at the school's open house April 26 at 7:30 p. m.

All parents of 6th grade students of Fremont, Lowell and Naples elementary schools are invited to the showing of the film, "The Junior High School Story," which will serve as an introduction to the social and educational program of the junior high school. The office staff will be present to meet the parents in the school auditorium.

Students already attending Rogers will give their parents the opportunity of following their daily schedule of classes from room to room. The teachers will discuss briefly the basic objectives of the class work which will be posted on the board, show the material used and have a display of work. Members of the newly organized student government class will act as hosts and hostesses and direct the parents. The orchestra will play during the evening.

All facilities of the school will be open, and the public is invited.

Birney

April 24 is the date of Alice M Birney Elementary School's Open House. Each parent is invited to come to the school from 7 to 8 p. m. to see the work of his child and to meet his teachers. In addition to classroom activities, the P-T.A. will have an exhibit in the recreation room. Also, the character education groups will have displays there. In the cafeteria, the Birney faculty and staff will feature instructional material exhibits.

Room mothers and dads will be special hosts at this event with the student council officers and representatives as student hosts.

"IT'S EASIER having been divorced once," she said, "to elect divorce as the way out again. But if the alternative of divorce is rejected, the couple tend to work harder at making their marriage a success. Since they are usually older and more experienced, they have a better chance of winning out."

Dr. Bernard said that in any remarried combination where there is a divorced woman, the proportion of success is smaller.

She said the least successful remarriage is likely to be one where both partners have previously been divorced. Most successful are widowed persons remarrying, particularly a widowed woman.

"We have also learned," she added, "that the step-relationship isn't necessarily disastrous —'Snow White' and 'Cinderella' to the contrary. Difficulties, when encountered, are the result of a low socio-economic status and are not inherent in the step-relationship itself."

Dr. Bernard said a study of Penn State students who were children in remarried homes showed that they suffered no handicaps from having a step-parent.

Dr. Bernard also noted that in America today "there are more second spouses than in societies where polygamy is the approved

C-1—Mr. and Mrs. E. J. (Gene) Grau of Pasadena, division marshals. Gene has been in last twelve Tournament of Roses parades, won 48 trophies in 1949. He rides pureblood Arabian stallion. She rides Palamino quarter horse.

C-2—Bishop Band Color Guard (See C-4).

C-3—Bishop Band Majorette and Pom Pom Girls (See C-4).

C-4 — Bishop Band of Utah leaders. Pipe Major is John H. Rosenberger.

D-9—Lakewood Players' car.

D-10—Pomo Indians, marching group of 16 boys in full Indian costume, from Lawndale, Calif. Managed by J. M. Blankenship, led by Chief Thunderbird and Assistant Chief Little Crow, famous for costumes and dancing.

D-11—Paulette's Twirlettes, sponsored by Exchange Club of

majorettes of San Diego, 12 majorettes, ages 14 to 18, first place in National City Maytime Band revue last year.

D-17—Highland Guards Bagpipe Band of Monrovia, Calif. 14 members. Every man either born in Scotland or of Scottish descent. All uniforms purchased in Scotland. Each man with his own clan tartan.

D-18—Huntington Park Elks Motor Corps, 17 men.

Finds Grass Seed Mixtures Wrong

GENEVA, N. Y. (AP)—Lawn seed mixtures suitable for permanent lawns generally aren't what they should be, according to an expert at New York state's agricultural experiment station here.

Dr. B. E. Clark, head of the department of seed investigations, has some words of warning for those buying lawn seed mixtures.

* * * *

Had Enough

PROVIDENCE, R. I. (AP) — Enough is enough, says Earl Jenckes, a Pennsylvania manufacturer. Jenckes, who is 80, has declined to accept a $100,000 legacy from the Rhode Island estate of his sister. Said he didn't need any more money.

common or the Merion varieties. The 108 brands analyzed, he said, contained an average of only 14 per cent Kentucky bluegrass—and fewer than 5 per cent contained the desired amount.

Dr. Clark noted that other "basic" grasses desired in a good lawn mixture include red fescues, rough bluegrass and colonial bentgrass. These, along with Kentucky bluegrass, should make up 80 per cent of the mixture, he said.

Good Fishing

PORTSMOUTH, N. H. (AP) — New Hampshire's tiny 14-mile coastline is well exploited by fishermen. The federal Fish and Wildlife Service says 5,630 fishermen invested nearly $600,000 in boats and tackle in this region.

BUY-PLAY!

Current Edison advertising on the advantages of electric cooking takes the form of deft and definitive dialogue. Shown here is one of a series appearing in newspapers throughout the Edison service area.

Taking up the benefits point by point, each of these advertisements features some sales-pointed repartee. And alert electrical appliance dealers can make it even more to the point by putting in a few words of their own through tie-in advertising. It generally happens that "buy-words" and "sell-words" combine effectively to make profits!

Southern California Edison Company

worth more?
certainly!
costs more?
certainly not!
Amazingly clean, completely automatic, thoroughly dependable —so many things about electric cooking make it worth more. Yet with all its extras, electric cooking costs so little! See your dealer.
live better electrically
SOUTHERN CALIFORNIA EDISON COMPANY

'Rock-n-Roll' Unloads Cars

CHICAGO (AP)—Rock-n-roll has come to boxcars.

A new unloader uses a gentle rocking motion to empty boxcars of grain and other free-flowing bulk materials.

The manufacturer said the unloader locks 150,000-pound loaded cars in its grasp on a steel

riders on prancing show horses will present Lakewood's biggest parade in history Saturday as part of the Pan American Festival.

Seventy-five units, lined up in four divisions, will compete for trophies. Entries come from all over Southern California, including San Diego, Riverside and Sherman Oaks.

The "Saludos Amigos parade" has been planned as a massive greeting to representatives of Central and South American

Del Amo Blvd., west to Clark Ave., south to Arbor Rd. and east to disbandment at Pan American Park.

Parade units will be judged from a reviewing stand on the west side of Bellflower Blvd. between Candlewood and Hardwick Sts. Members of the consuls' families and other special guests will be seated in bleachers at this location.

Frank Vessels Jr., who operates Los Alamitos Race Track with his father, will judge the

formerly head majorette, Long Beach Wilson High School Band. All are members of the Southern California chapter, All American Assn. of Contest Judges.

Elta Certain, clerk for the Long Beach All Western Band Review, will be tabulator of results. Lakewood Councilman Eugene K. Nebeker will be parade commentator at the reviewing stand.

Trophies and ribbons will be awarded at the reviewing stand

features:

- Utilizes new 800 MA high output lamps
- May be mounted within 12" of ceiling
- Meets ASA school standards
- High adaptation level with low brightness and brightness ratios
- Flexible in arrangement

NEW SMOOT-HOLMAN LUMINAIRE

PERFECT VISION

When all cost factors are considered, Smoot-Holman's Perfect Vision indirect luminaire will be the choice for commercial, school and institutional lighting requirements. Its revolutionary "new as tomorrow" design gives more light per dollar than ever thought possible . . . yet continues Smoot-Holman leadership in quality and efficiency.

Investigate the many advantages of this excitingly new, architecturally beautiful luminaire. Contact your local Smoot-Holman office or write direct for Catalog PV-288. **SMOOT-HOLMAN** *Inglewood, Calif.*

WE SUPPORT THE NATIONAL LIGHTING BUREAU

SERVICE IN THE WEST AND SOUTHWEST FOR ALL SCHOOL, COMMERCIAL AND INDUSTRIAL LIGHTING

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

THE ALL-INDUSTRY MAGAZINE OF PROGRESS, ESTABLISHED 1887,
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Next Month

June is the annual special convention issue. In addition to coverage of a number of industry meetings, there will be summaries of important presentations before these meetings.

Presidents of the West's three industry associations will, as usual, make their annual reports.

Of special interest this year will be the "Distribution Story," a searching analysis of present distribution practices and a look at some significant trends.

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Cleveland (15).....Frank Seiler, R. A. Hubley, 1510 Hanna Bldg., Superior 1-7000
Los Angeles (17).....Carl Dysinger, 1125 West 6th St., MA. 6-9351
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Racks are designed for a minimum space requirement and can be passed through a 30"-diameter manhole.

Submersible equipments...

L-M's New Secondary Network Capacitors Increase Capacity, Improve Voltage

Line Material's new 216 volt, 13⅓ kvar submersible capacitor equipments can be your answer to heavier network loading. Secondary capacitors will improve the low power factor of heavy motor loads, such as air conditioning. This substantially reduces loading on conductors and transformers, and helps to improve low voltage conditions. Capacitor units can be installed more quickly and at much less cost than system changes, such as larger transformers, cables and additional vaults.

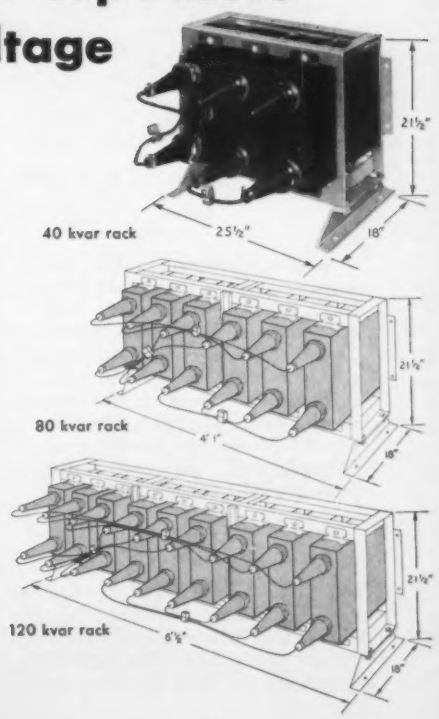
L-M's new secondary capacitors have outstanding product features such as aluminum metallic coating under a primer and finish coat of alkyd resin paint, strong solder-sealed bushings, and low-temperature Elemex liquid dielectric. Each unit is equipped with one terminal mounted current limiting fuse; bushings are enclosed in water-tight covers.

Capacitor Racks

Capacitor units are available in 40, 80, and 120 kvar racks, entirely assembled at the factory and ready for installation in the field. Racks can be stacked or mounted on floor, wall, or ceiling in many arrangements to fit vault space. Ambient temperature limits are 55° C. for single-tier equipments and 40° C. for two- or three-tier equipments.

Get Complete Information

Ask the L-M Field Engineer for information on features, design, and delivery on L-M's new secondary network capacitors and capacitor equipments. Or write Line Material Company, Milwaukee 1, Wisconsin

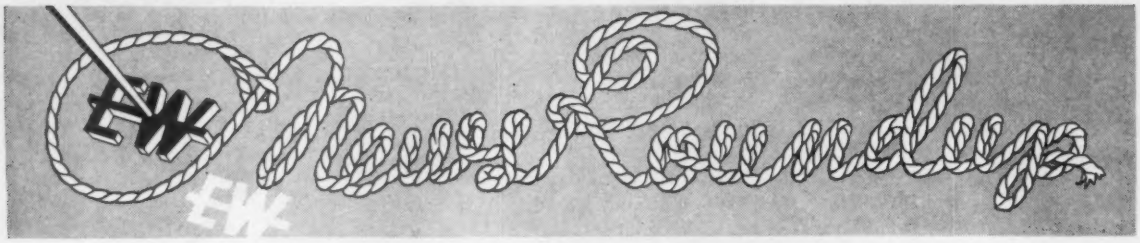


LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION

247

Elemex® Capacitors



SIGNIFICANT ITEMS FROM THE EDITORS' NOTEBOOKS

OUTLOOK—At the close of the first quarter of 1956, economists took another look at business prospects for the year and refused to be budged from their previous position that it likely will set an all-time record for business activity. Industrialists appear to share this view also as the program for new plants and equipment planned for the year has reached $35 billion compared to $29 billion in 1955. Such expansion foreshadows still greater increases in the gross national product for subsequent years.

Backlogs for heavy capital goods are building up. Many machinery companies have pretty well booked their full 1956 output and are quoting 1957 deliveries. In the electrical field, General Electric reports that its turbine order backlog is now 19,000,000 kw with shipments scheduled as far ahead as 1959.

Too much prosperity, however, can breed trouble. Labor very probably will go in for sizable wage increases. Steel workers have already announced demands for real and fringe benefits estimated to total from 30 to 50c an hour. Higher wages, material shortages and possible increased defense spending are the stuff of which inflation is made.

—EW—

Southern California Edison Co. is moving ahead with plans for a large modern steam plant near the northern end of its system. Last month the company filed a zoning application with the Ventura County Planning Commission for its hundred-acre tidelands site at Mandalay Beach near Oxnard, Calif. The cost of the project will be $68,000,000.

—EW—

NEW CONCEPT (See photo on cover)—Luminous walls as well as luminous ceilings may be the next new technique for modern living. Nela Park researchers are experimenting with luminescent walls as a means of creating mood, atmosphere and usefulness in the rooms of a home. By the use of dimmers, which enable the brightness of the walls and ceiling to be varied or the use of color combinations in either, an infinite variety of harmonious conditions can be created. This substitution of the structural elements of a home as light sources instead of using lamps or fixtures may be the threshold of an entirely new lighting era. Only it's going to be a little hard for some of us old-timers to remember to say, "Johnny, did you turn off the wall?"

—EW—

A legal opinion announced last month cleared the way for the wheeling of power from Grant County (Wash.) PUD's Priest Rapids project over the Bonneville Power Administration transmission grid. Contracts, according to the opinion, may be written for power interchanges or for wheeling.

—EW—

THERMAL PLANTS—Western Canada thermal plants made news last month. The British Columbia Power Commission confirmed that it will build a 75,000-kw gas-turbine plant on Vancouver Island, costing between $13,000,000 and $15,000,000. Two simple cycle and two regenerative cycle gas turbine units will be ordered from the Canadian General Electric Co., making this station a contender as the largest gas turbine power station for central electricity production in the world.

Gas turbines were selected because of the need for peaking capacity on Vancouver Island and for supplementing hydro flows in low-water years. Speed of construction was also a factor in the decision. Heavy fuel oil will be burned.

Almost simultaneously, the British Columbia Electric Co. announced that it would build Canada's first large-scale thermal electric generating station near Vancouver, B. C. The new plant will burn natural gas and generate approximately 100,000 kw in four turbogenerator units. Three of the four units are expected to be in operation during 1958.

—EW—

UNDERGROUND—Pacific Gas and Electric Co.'s new Poe power house will rest on bedrock, far below ground level. Contract for the construction of the new unit on the Feather River was awarded to the Bechtel Corp. of San Francisco. The plant is part of a project that will develop 106,000 kw at a cost of nearly $35,000,000.

The plant will be entirely below-ground constructed in a deep excavation. Ground will be filled in again around the concrete structure to provide yard space for the unit. A 240-ton gantry crane will lift equipment in and out of the pit through a hatchway.

—EW—

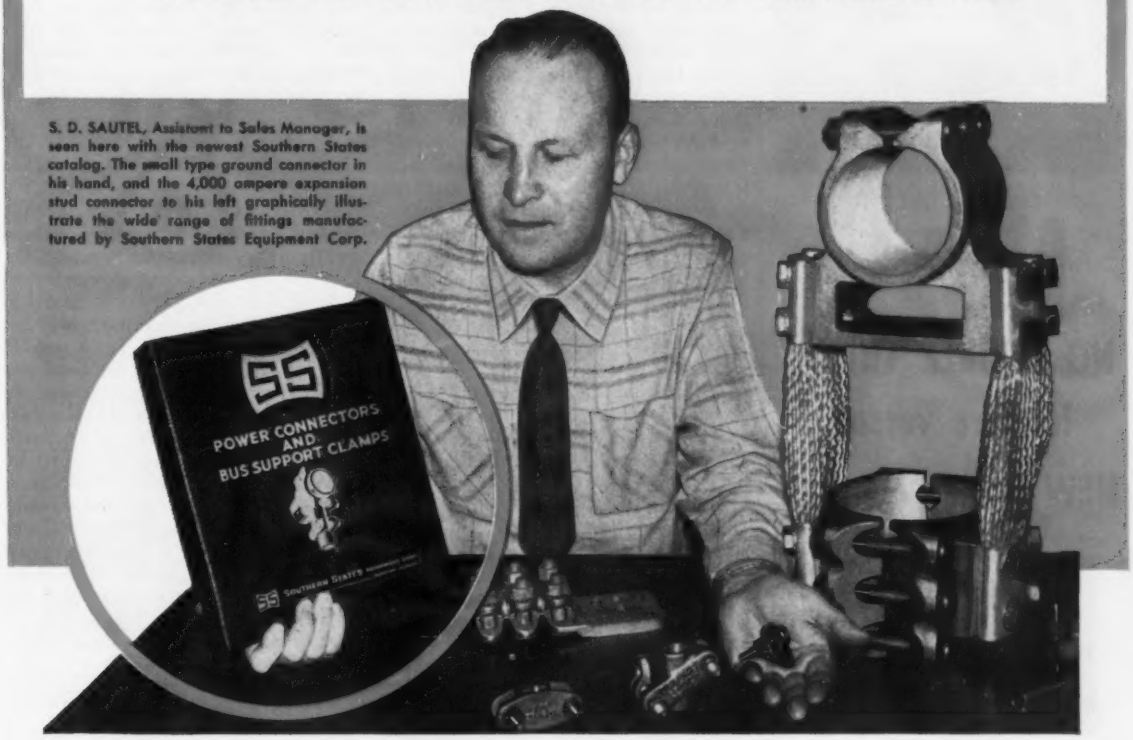
Only 25 years ago last month the first microwave demonstration was held. This first beam linked Calais to Dover and was soon followed up as a practical achievement when IT&T installed the first commercial microwave link between England and France in 1933. Microwave marvels such as radar, TV and other forms of communications are so commonplace today that it seems almost incredible that they have all come to pass within a quarter of a century.

—EW—

FIVE-YEAR PLAN—The Rural Electrification Administration released figures last month covering the construction plans for its 984 active rural power systems covering fiscal years 1957 through 1961. Rural power lines and general system improvements will require $805,000,000 in that period.

THIS CATALOG CONTAINS

THE POWER CONNECTORS AND BUS SUPPORTS NEEDED FROM GENERATION TO DISTRIBUTION



S. D. SAUTEL, Assistant to Sales Manager, is seen here with the newest Southern States catalog. The small type ground connector in his hand, and the 4,000 ampere expansion stud connector to his left graphically illustrate the wide range of fittings manufactured by Southern States Equipment Corp.

Three years ago Southern States began an extensive program of re-designing and expanding its line of power connectors and bus support clamps. Ears were strengthened and weights increased 40% to 50%.

The result is a line of rugged fittings in a full range of sizes and types. You can choose a suitable Southern States connector for application on your system for practically any requirement . . . from the generating station to the distribution system.

The complete line is included in the new Southern States catalog, which is fully illustrated and indexed to make it easy to find the exact fitting required for any application.

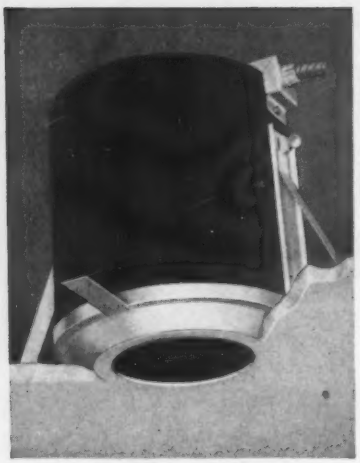
If you have not yet received your copy and could use one, see your Southern States representative or write direct for Catalog No. 526.

SS®

SOUTHERN STATES EQUIPMENT CORP.

HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



Now!

NO VISIBLE TRIM

in kurt versen's

NEW Reflex!

This newest fixture simplifies the problem of maintaining an unbroken ceiling line.

- *no visible trim on ceiling*— a perfectly smooth ceiling, without special plastering or handling.
- *practically invisible light source*— dramatic lighting effects, at maximum efficiency.
- *baffled down-light* or adjustable beam models available for widest applications.
- *top or bottom servicing*— standard on all units, with maximum ease of replacing lamps.
- *all electrical work at one time*— cuts installation costs in half, because of kurt versen cost-reducing detachable yoke construction and no-frame* installation.

For the latest improvements in lighting design, always refer to kurt versen fixtures...they look better, work better, last longer.

kurt versen company

englewood, new jersey 32

contemporary lighting creatively engineered

*U.S. Patent 2,456,903; 2,614,785; other pats. pend.

Of this amount, systems in the 11 Western states will account for $97,-111,000; and in Alaska $10,782,000.

For the U. S. as a whole, rural electrification, based on the above figures, represents about 5% of the total annual expenditures for electric power facilities in the country.

—EW—

UPTAKE—Westinghouse Electric Corp. is relying upon a mighty advertising campaign to help it catch up for the time lost during the recent 156-day strike. Chris J. Witting, vice-president and general manager of the Westinghouse Consumer Products Divisions, told the press, "By this all-out [advertising] effort Westinghouse is confident is will quickly regain its long-standing eminence in the American economy. Further, we expect to boost sales of our consumer products by 35% or more over 1955 levels in the remaining nine months of 1956."

—EW—

A five-minute radio news program for and about engineers in southern California is being aired by Beckman Instruments over a major radio station. One of its purposes is to stimulate students' interest in engineering as a career.

—EW—

RECHARGE—Who hasn't cussed the flashlight that wouldn't work right when you needed it most? The perennial headache caused by short flashlight battery life may be eliminated with a new nickel-cadmium rechargable flashlight battery. It is a development of Gould-National Batteries Inc., which provides a small unit to recharge this type of battery without removing them from the flashlight. Price of the home kits (flashlight, batteries and charger) is $20 for the one using the 110-v recharge source and $15 for one using an automobile cigarette lighter receptacle as the power source. Batteries give 5 hours of light per charge. The company anticipates the new units will be popular in industry as emergency light sources.

—EW—

SALVAGE—In a major reconductoring job, the Pacific Gas and Electric Co. will replace the copper on its Pit No. 1 and No. 2 220-kv transmission lines with aluminum. In addition to replacing the 145 miles of conductor on these two lines, the insulation level will be increased by adding one insulator to each of the strings to bring them into conformity with the company's standard of 15 5¾-in. insulators per string. New crossarms also will be required to provide greater clearance necessary for the aluminum. The price tag for the project will be $3,025,000.

Frank Baxter, PG and E's purchasing manager, states the company expects to salvage about 7,000,000 lb of copper. At the current price for scrap copper this would represent a substantial part of the reconductoring cost. Salvage, however, was not the only consideration. Corona and resistance losses will be less with the new aluminum and radio interference will be substantially reduced.

—EW—

ATOMIC ACCIDENT—The Atomic Energy Commission finally released details of the first reactor accident. On Nov. 29, the experimental breeder reactor at Arco, Idaho, was damaged in an experiment to determine the behavior of the reactor during a sudden power increase. During the final test of the series, verbal instructions to shut off the reactor instantly were misunderstood and the resultant heat produced was sufficient to damage the reactor core. Apparently it was partially melted. Some radioactivity was released within the building which was promptly evacuated, but no significant radiation, exposure or damage occurred. No one was hurt and the cause was set forth as "human error."

—EW—

Popular government without popular education is a prologue to a farce or a tragedy.—**James Madison.**

—EW—

IRRADIATION—Beneficial effects from atomic irradiation made news last month. Apparently a whole bevy of new and improved products and materials may be just around the horizon.

For example, the Sequoia Process Corp. and the Stanford Research Institute have produced a new electrical installation with greater tolerance to heat by exposing special polyethylenes to electronic bombardment.

The Standard Oil Co. of California released information about new synthetic lubricants that perform better when subjected to atomic radiation than they do under ordinary operating conditions.

By irradiating relatively inexpensive diamonds, they can be made to resemble the more expensive types. The

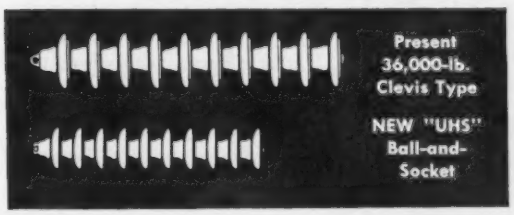
New UHS Ball and Socket Suspension Insulator

Combines close coupling and ultra-high strength with small size—ideal for bundled conductor applications

Never before has such an amazing combination of high mechanical and electrical strength been concentrated in so small an insulator. The unique strength and compactness of "UHS" (Ultra-High Strength) suspension insulators permit economies in transmission line design which should prove most valuable to the utility industry.

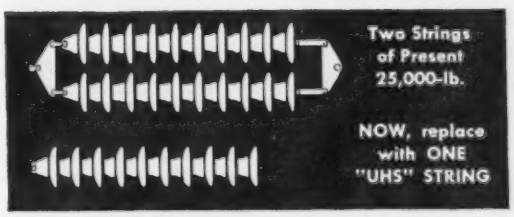
Greater weight-carrying capacity. Shorter strings. Elimination of need for double-string dead-ends. Shorter towers for ultra-high voltage lines. Light weight and simple handling reduce labor costs. All these are now within reach with the new Locke "UHS" insulator.

Look over the facts below. Picture how this development can affect your system. For further details, see our representative nearest you.



5¾-INCH SPACING

Provides higher flashover per unit string length than present standard 36,000-lb. clevis type insulator, the unit with the nearest comparable strength rating. Even with reduced diameter, effective leakage distance is increased in a given string length.



ULTRA-HIGH M&E, IMPACT STRENGTH

In use with bundled conductors, each conductor of the bundle may now be dead-ended on a single "UHS" string. Strength permits use of one "UHS" string to replace two 25,000-lb. strings on dead-end installations, effecting substantial hardware and labor savings. High impact strength and the handling of fewer units minimize breakage loss.

10-INCH DIAMETER, 15½ LBS.

16% smaller and 35% lighter than the A.S.A. Standard 36,000-lb. insulator. Less storage space, more efficient trucking, easier handling.

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Progress Is Our Most Important Product

LOCKE

NEW Revere ELECTRIC MFG. CO. CHICAGO, U.S.A.
WEATHER-TIGHT
15° HORIZONTAL FLUORESCENT
Luminaire

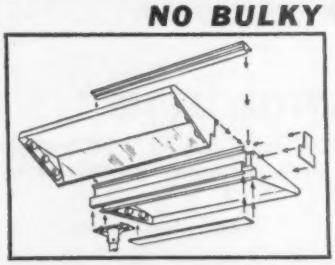
9300 SERIES

IN STEEL— COLORS: GREEN, RED, BLUE, CREAM, WHITE AND ALUMINUM

Made in 4 and 8 foot Units using Slimline or Rapid Start Lamps.

4 and 8 foot Units may be combined for a continuous length of Uniform light.

STRONG—RIGID UNIT CONSTRUCTION
NO BULKY PIECES TO HANDLE



Slip Fitter adjustable to any pole spacing up to 12 feet *without SAG.*

Luminaires made in half fixtures—mechanically and electrically independent of each other.

FINEST ON TODAY'S MARKET • WRITE FOR BROCHURE AND PRICES

Revere ELECTRIC MFG. CO. CHICAGO, U.S.A.

6009-17 BROADWAY
CHICAGO 40, ILL.

In Canada through CURTIS LIGHTING, LTD., Leaside, Ontario

THE COMPLETE LINE OF FLOODLIGHTS • LUMINAIRES AND POLES FOR SERVICE STATION SPORTS • AIRPORT • STREET • OUTDOOR THEATRE • MARINE AND INDUSTRIAL LIGHTING

Atomic Energy Commission will irradiate gems in the same manner as requests for other service irradiations are processed. However, the Federal Trade Commission insists that purchasers of the end product be informed that gems have been so processed.

—EW—

ANSWER — How many times have you heard someone ask the question, "What are all these people going to do who are moving West in such great numbers?" At least part of the answer can be found in a compilation made by the Southern New Jersey Development Council. Its investigations reveal that a new industry entering into a community and employing 200 people will support:

393 homes
33 stores and shops
24 professional men
18 teachers
$2,500,000 tax base
1,400 population
320 autos
$750,000 in retail sales
6,600 acres of farm products
22 schoolrooms
$1,500,000 worth of life insurance
$1,000,000 in bank deposits

After digesting those statistics, and looking at all the new plants which you see no matter which direction you drive out West, you can begin to worry as to whether or not there will be enough people out here to fill all of the new jobs that are being born.

—EW—

Speaking about worry, Ole Svenson, our mythical line crew foreman, tells his boys, "Worry is like the rocking chair. It gives you something to do, but it doesn't get you no place."

—EW—

SAFETY BOOST—Tangible recognition for safety performance is one way of keeping safety uppermost in the employee's mind. The Salt River Power District awards each employee of a group competing for safety honors with Zippo pocket lighters the first time the group turns in a one-year "no lost time accident" record. Second-year winners each receive sterling silver pocket knives. For a third-group win each individual gets a Zippo table lighter. Whether by accident or design it is to be noted that the first two personalized gifts are something that the recipient will carry with him, perhaps as a reminder of the benefits of working safely. By the time the em-

National Electric Service Entrance Cable

National Electric Service Entrance Cable is lightweight, easy-to-handle, smooth-looking and dependable under all kinds of weather conditions.

It's furnished with two and three conductors with or without ground. To assure easy identification on the job, each conductor is color-coded and the outside sheath shows numbers and size of conductors between measuring markers spaced every two feet.

To assure long service life, conductors are heat and moisture resistant rubber insulated rated at 75°C. They are manufactured in accordance with N.E.C. thickness for 600 volts and protected by a moisture and flame resistant "Safecote" finished "Dilec" fibrous covering. The concentric conductor is covered by a cable tape and closely woven impregnated cotton braid.

The result: a neat, neutral gray service entrance cable that won't bleach out . . . can be readily painted if desired. If you take pride in your installations, specify National Electric Service Entrance Cable. You'll find it helps you do the job right.

National Electric Products

TORRANCE, CALIFORNIA

Branch Offices: San Francisco • Seattle • Denver
Los Angeles • Salt Lake City • Portland • Phoenix

NATIONAL ELECTRIC SPECIAL CABLES WILL MEET YOUR REQUIREMENTS FOR POWER, CONTROL AND ELECTRICAL EQUIPMENT

NOW... CHANCE PIKE POLES ARE LAMINATED!

For greater uniformity... greater rigidity!

Now...Chance Pike Poles are made by bonding together carefully selected Douglas fir boards. Laminated Pike Poles have many advantages over the old, single board pike pole. They're more rigid. They're more uniform. Each board reinforces the other.

SAFETY PIKE—*Point can be reversed as shown in circle, for safety in handling and transporting between jobs.*

PLASTIC PROTECTED

Chance *laminated* Pike Poles are available with tough Maplac plastic coating. Splintering of the wood is eliminated. Lost-time hand injuries, caused by splinters, are avoided. *IT PAYS TO BUY HIGH QUALITY IN A PIKE POLE.* Only on a Chance pike pole will you find the steel reinforced butt which protects the end of the pike. And only *laminated* Chance pike poles are available with Maplac protection.

Write for the full story today.

CT55-1A

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA

ployee rates the table lighter, safety is probably well ingrained into his working habits.

In 1955 individual awards were made to employees of the following divisions which all chalked up a no lost time accident record: the Crosscut machine shop, meter shop, hydro plants, engineering survey crew, warehouse, the Kyrene steam plant and the Crosscut steam plant.

—EW—

COWLITZ HASSLE—Washington's Governor Langlie and municipal officials of Tacoma are still verbally battling it out on Tacoma City Light's Mayfield Dam project. The governor cites a 1949 state law prohibiting dam construction on the Cowlitz and states he has no other course but to enforce the law. The law, incidentally, was designed to protect fishing.

The Tacoma contingent pointed out that the state supreme court has held the 1949 law inapplicable to the Tacoma project because the city had applied for an FPC license before legislative action had been taken. The issue, therefore, from the city's viewpoint, is whether the project would unlawfully interfere with public navigation on the river. (See picture, p 128.)

Tacoma's two projects on the Cowlitz, Mayfield and Mossy Rock Dams, also are under fire from Olympia as being too expensive a way to produce peaking kilowatts. Tacoma counters this one by pointing out that integration of Seattle's Skagit River projects through BPA completely changes the economic picture. The Skagit and the Cowlitz have different flow characteristics that balance each other out.

—EW—

TAX BITE—Pacific Gas and Electric Co., one of the country's three largest utilities, paid the tax collector $120,414,000 for the privilege of doing business last year. Property taxes, which totaled nearly $45,000,000, were distributed among 193 cities, 49 counties and more than 1,500 school and other special districts. School districts, incidentally, took over $20,000,000 of the total. Uncle Sam, as usual, got the biggest share, amounting to more than $66,000,000.

All in all, taxes absorb 26% of the company's gross revenues from all sources and were the company's largest single item of expense. The fact that taxes paid amounted to approximately $75 per meter served will undoubtedly provide ammunition to the opponents of tax-free, subsidized federal power.

TRANSPORT PROBLEM—The Southern California Edison Co. has asked the California Public Utility Commission to require that local gas companies deliver fuel to Edison company steam plants on an "exchange" basis. Company officers in testifying before the commission indicated that Edison has opportunities to purchase substantial supplies of natural gas in California fields that are not now being utilized by local gas companies. Lacking transportation, Edison wants the privilege of turning over to the gas companies supplies of gas it might purchase or acquire and, in turn, receive gas delivered where most needed on the Edison system.

If the commission does not view the request favorably, the Edison company stated it was prepared to build its own gas transportation facilities.

—EW—

A LINEMAN from the Rocky Mountain area writes: "The banker looks prosperous, the car salesman drives a nice car, the doctor looks germ free. Most people look like they're sold on their product. Yet too many power company employees still wash dishes and the wife of the appliance store owner is seen hanging out her clothes. How can you sell electricity to the neighbors if we people in the electrical industry aren't sold enough on it to use it?"

Makes you wonder just how much new business and new load would be developed if everyone associated with the electrical industry had an all-electric home.

—EW—

NEW PROCESS—Use of aluminum for conductors in electrical motors and other electrical equipment may be much closer with the announcement of a new technological development by a Canadian aluminum manufacturer. The new process uses alternating current to anodize aluminum wire, giving it a ductile oxide coating which, in effect, becomes an electrical insulation. The anodic film is highly resistant to heat and sufficiently ductile to withstand stressing and flexing operations involved in winding electrical coils.

—EW—

REMINDER—Make reservations now for: NWEL&PA, Accounting & Business Practice Section, Portland, Multnomah Hotel, June 21-23; American Institute of Electrical Engineers, summer and Pacific general meeting, San Francisco, June 25-29.

SELKYD–a new kind of plastic improves watthour meter base plates

and Sangamo brings it to you!

In order to find the ideal material from which to mold watthour meter base plates, Sangamo and Glaskyd, Inc., pooled their efforts.

The result is Selkyd.*

A Selkyd base plate on a watthour meter has many advantages. It resists corrosion. It has a high resistance to arc tracking. Having great impact strength, a Selkyd base plate will stand up to physical punishment. And because Selkyd is an inert organic substance, base plates made from it have great dimensional stability.

Adoption of this Selkyd base has in no way altered the electrical characteristics of the J2.

Every Sangamo J2S meter you buy will come to you with a base plate made from this remarkable new plastic . . . and at no extra cost.

Selkyd base Sangamo meters will be shipped to you sealed. You'll find them so accurately calibrated . . . so solidly built . . . that no adjustment is necessary.

**A thermosetting resin combined with glass fibers—in contrast to ordinary phenolics having wood fibers as a filler.*

JM56-3

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Isolate load circuit faults with G&W Type "FC" Oil Fuse Cutouts

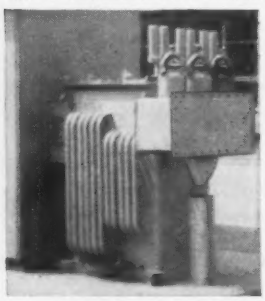
FC42

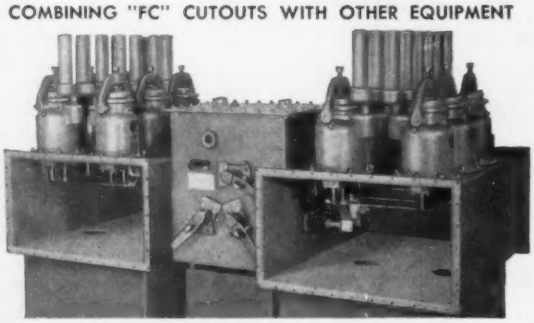
All steel enclosure, hermetically sealed—oil filled, protects men and equipment by safely withstanding high pressures of high voltage fuse clearing a heavy short circuit. In addition to the main purpose—a pressure tight enclosed fuse—the device serves as a full load break oil switch, three phase with gang-operated mechanism. Switching contacts are Beryllium copper. Fuse links are simple, inexpensive and easily replaced. Cable entrances are interchangeable—wiping sleeve, stuffing box or porcelain.

FC42

	Three sizes	Interrupting capacity per cutout
FC31	2500 volts, 100 amp.	6000 amps. at 2.5 Kv.
FC42	5000 volts, 200 amp.	16000 amps. at 2.5 Kv.—8000 amp. at 5 Kv.
FC61	8000 volts, 100 amp.	5000 amps. at 8 Kv.

SAVE INSTALLATION LABOR BY COMBINING "FC" CUTOUTS WITH OTHER EQUIPMENT





Send for Bulletin CB56 (New, January 1956). Call in our representative.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois,

Representatives in principal cities of U. S. A.
Also made in Canada by Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

C561

Get the Regulator you can

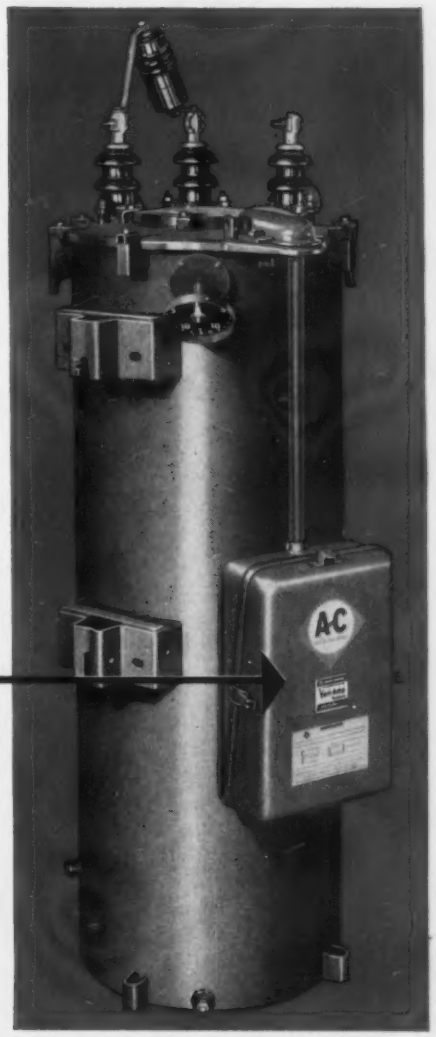
Tailor To Your System Needs

Vari-Amp feature has built-in provisions for system needs

Now you can tailor a voltage regulator to your system's exact requirements—no need to accept ±10% regulation if your system can operate more profitably at a different range. The *Vari-Amp* feature on Allis-Chalmers voltage regulators provides *five* current ratings — 25 regulating combinations.

You can even utilize unequal ranges of regulation. Here's how it might work on a distribution regulator: set a unit for 6¼% range in the raise direction, providing 135% current capacity, and for 10% in the lower direction, at 100% of current capacity.

In addition to providing for many variations to suit many different systems, the *Vari-Amp* feature gives you more for your regulation dollar by permitting increasing capacity in five steps. On a distribution regulator, for example, you can get 160% of current capacity by reducing the range of regulation to ±5%.



25 REGULATING COMBINATIONS

This regulator equipped with

Vari-Amp Feature

ALLIS-CHALMERS

Get the complete story on the unusual opportunity for matching a regulator to your needs and getting extra capacity with the *Vari-Amp* feature. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4900

ALLIS-CHALMERS

Full range of sizes . . .

One of the basic advantages you get with

BTC DROP-FORGED

MPL Aluminum Suspension Clamps

BTC OFFERS YOU a choice of exactly the right clamp for each size of A.C.S.R. or all-aluminum conductor. The close dimensional fidelity of the die-forged and die-formed parts makes unnecessary any bore size allowance for manufacturing variations in the clamps.

FULL RANGE OF SIZES is just one of many advantages you get by specifying BTC Drop-Forged Aluminum Suspension Clamps. These strong, light-weight clamps give longer service . . . increase conductor life . . . and provide cool, trouble-free operation with a minimum of power loss.

* * *

NEXT TIME you order from your insulator manufacturer, ask for BTC Aluminum Suspension Clamps. They are an important part of BTC's complete line of forged transmission line hardware.

TWELVE CLAMP SIZES are offered . . . each obtainable with socket, clevis eye or without adapter for use with U-Bolts or J-Bolts. A total of 72 variations are available.

BTC *Specify*

DROP-FORGED Hi-Line Hardware

. . From Your Insulator Manufacturer

THE BREWER-TITCHENER CORPORATION, Cortland, N. Y.

To All Our Distributor Friends...

PHELPS DODGE COPPER PRODUCTS CORPORATION

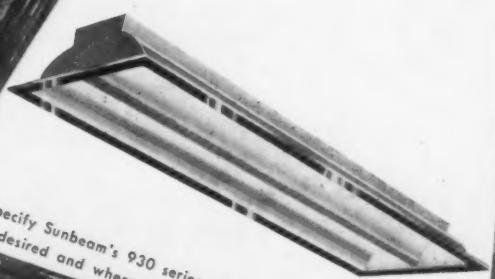
cordially invites you to visit
our Conference Booth 104-105
during the convention of the
NATIONAL ASSOCIATION
OF ELECTRICAL DISTRIBUTORS
Ambassador Hotel, Atlantic City, N. J.
June 10-14, 1956

PHELPS DODGE COPPER PRODUCTS
CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.

a new visionaire® for maximum visual comfort

Specify Sunbeam's L920 series for installations requiring high intensity lighting at the work plane and where low brightness at normal viewing angles is important.



Specify Sunbeam's 930 series for areas where maximum light is desired and where lengthwise shielding is not requisite.

An engineering triumph—the new 920 series Visionaire® is designed for high intensity, low brightness illumination. Through skillful use of diffuse Alzak double parabolic reflectors, 93.3% of the total illumination output is concentrated within the usable 0° to 60° work zone. Alzak reflectors and louvers not only distribute light more efficiently but sharply decrease glare from normal viewing angles for the ultimate in visual comfort.

Engineered for installation and maintenance ease, too: Ample knock-outs; continuous wiring channels; chain-suspended single-unit center "V" and louver assembly and diffuse Alzak with lifetime finish. Enamelled parts Bonderite-treated for maximum protection. Write for bulletin 747.

SUNBEAM visionaire LIGHTING COMPANY

SUNBEAM LIGHTING COMPANY

777 E. 14th Place, Los Angeles 21, California

General Electric offers new single-cycle BWR* for atomic power plants

Designed specifically to furnish energy for electric power generation

Forerunner of a whole new family of small power reactors, the General Electric single-cycle boiling water reactor is a new source of energy designed for power plants in a range of 5000 to 20,000 kw. It can be modified for larger ratings.

Boiling in the reactor itself and forced circulation offer these advantages:

(1) Simplified design; no main heat exchanger used. **(2)** High thermal efficiency. **(3)** Automatic control of response to load changes. **(4)** Greater safety since reactor is self-limiting in case of excessive nuclear reactivity.

This reactor uses fuel elements of the long-burnup type. Spent fuel elements are stored in the service pool adjacent to the reactor until cool enough for futher handling.

The reactor and service pool can be equipped for neutron and gamma irradiation for research without interfering with reactor operation.

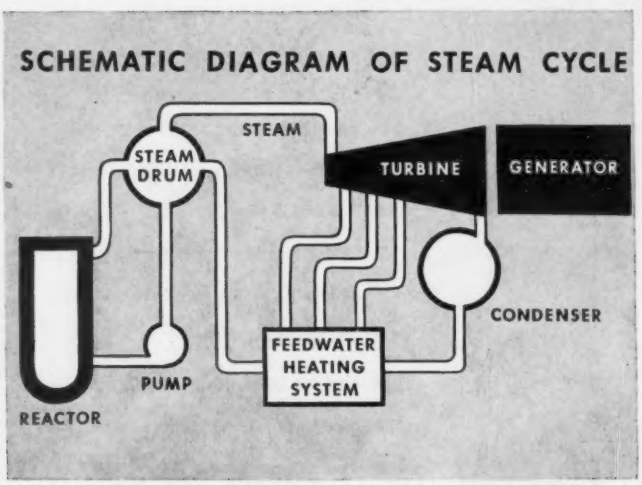
For more information, write for bulletin GER-1220, Sect. 192-7, or contact the Atomic Power Equipment Dept., General Electric Co., Schenectady 5, N. Y.

**Boiling Water Reactor*

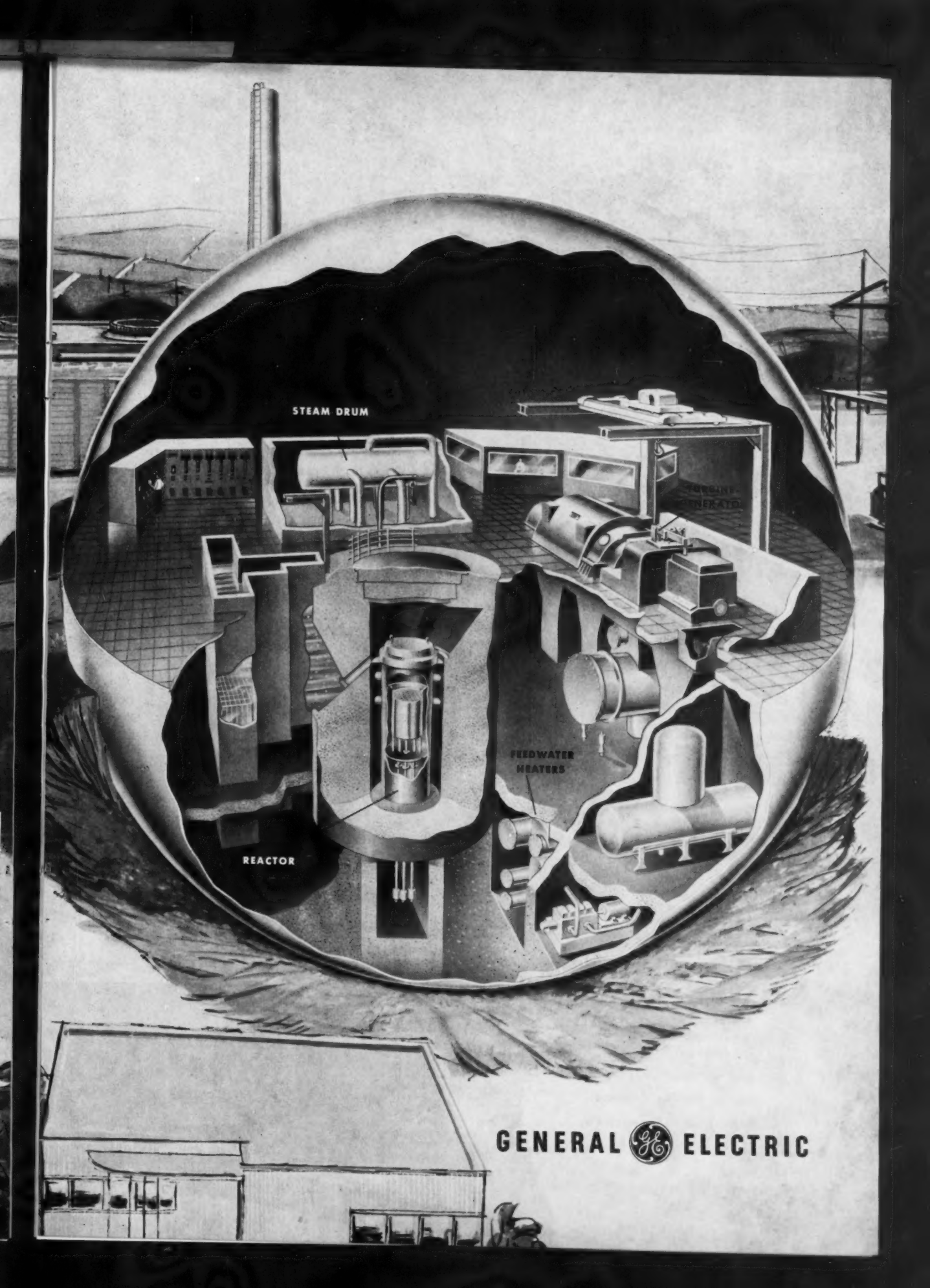
Progress Is Our Most Important Product

GENERAL ELECTRIC

SIMULATED FUEL ELEMENT being installed in a heat transfer loop for tests under reactor thermal conditions. This is one of G.E.'s supporting atomic development programs to advance reactor design.



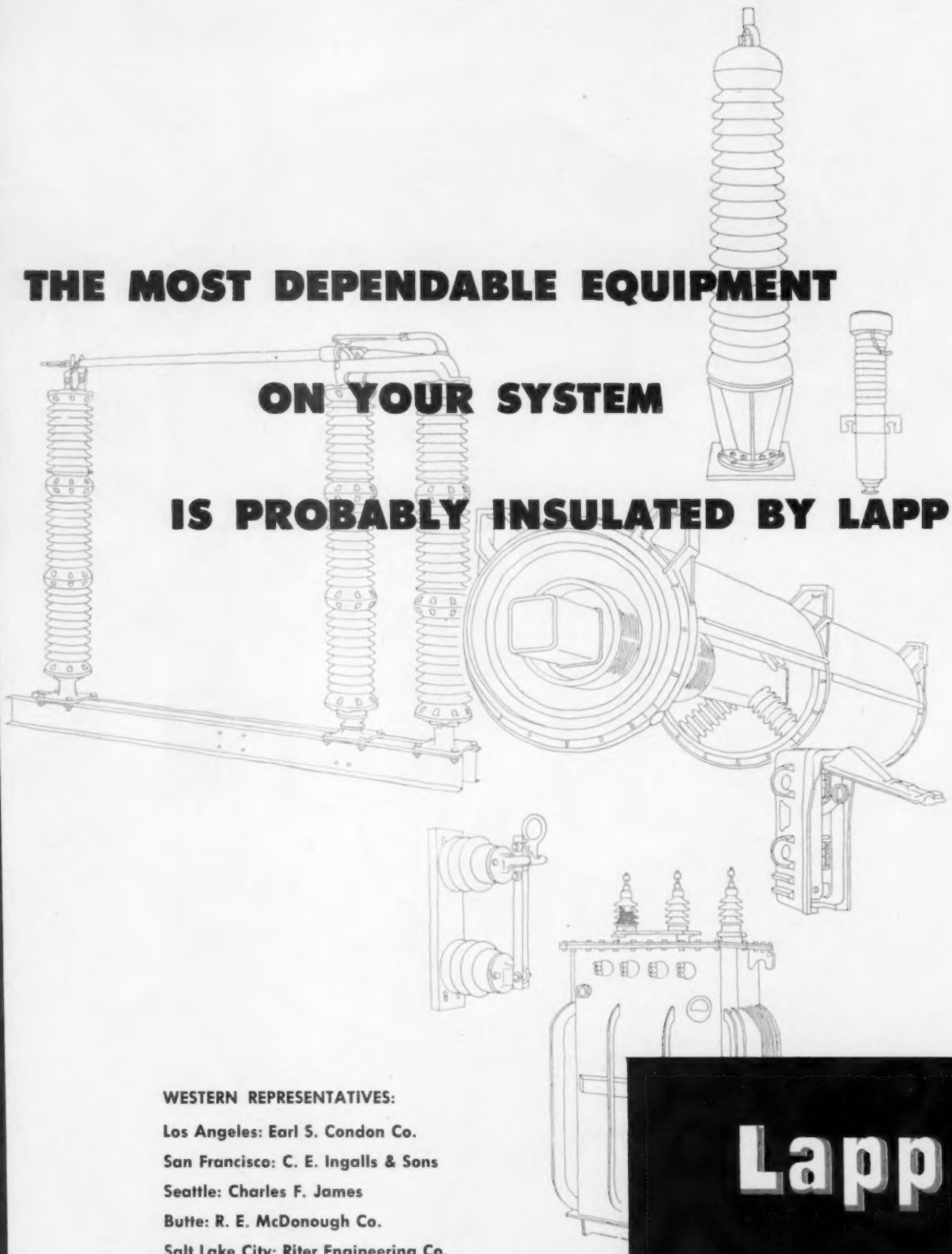
STEAM FLOWS FROM REACTOR to drum. Saturated steam passes to turbine; water goes to feedwater heaters and returns to steam drum. Forced circulation pump provides automatic control of response to load changes.


STEAM DRUM
FEEDWATER HEATERS
REACTOR
GENERAL ELECTRIC

THE MOST DEPENDABLE EQUIPMENT

ON YOUR SYSTEM

IS PROBABLY INSULATED BY LAPP.....



WESTERN REPRESENTATIVES:

Los Angeles: Earl S. Condon Co.

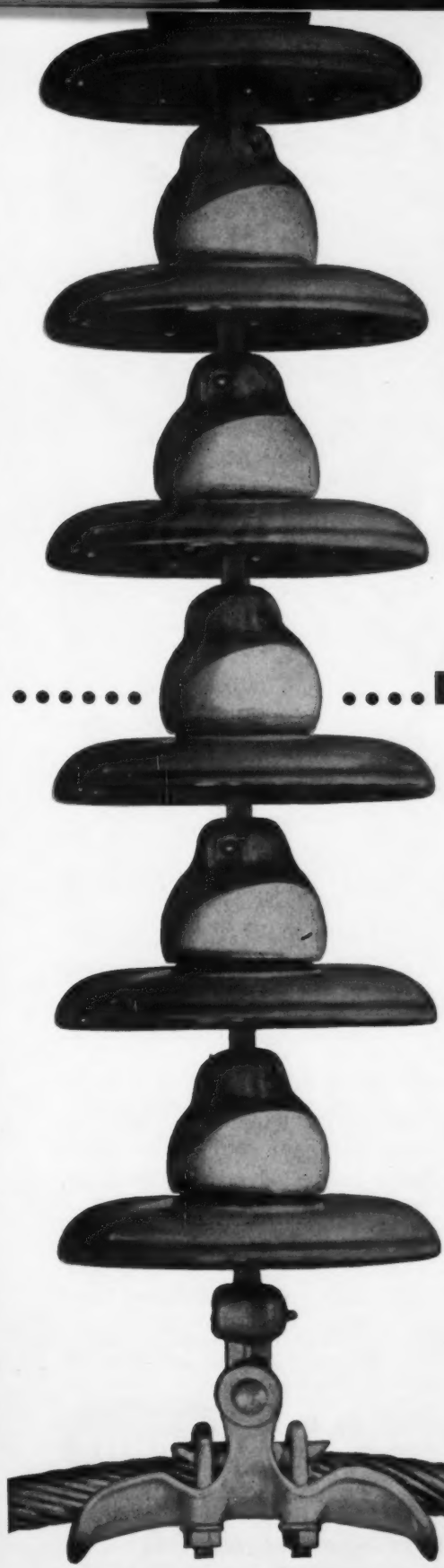
San Francisco: C. E. Ingalls & Sons

Seattle: Charles F. James

Butte: R. E. McDonough Co.

Salt Lake City: Riter Engineering Co.

Lapp



....HOW ABOUT

YOUR

TRANSMISSION LINES?

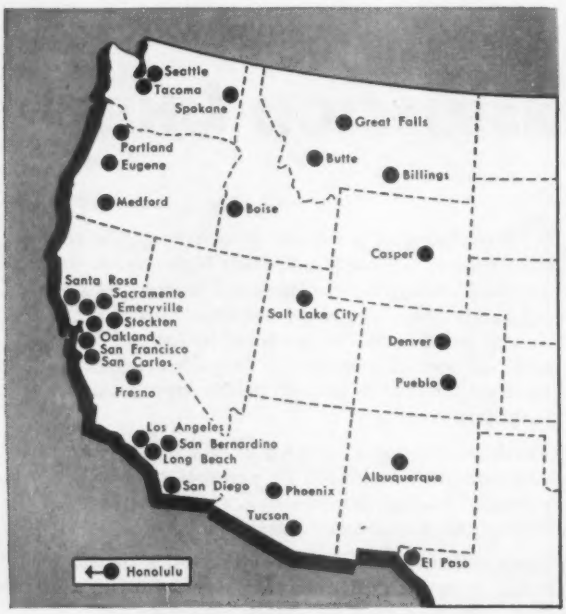
Manufacturers of the best in switches, transformers, lightning arresters, fuse boxes, and other high-voltage electrical equipment look to Lapp for insulators and "special porcelain" insulating components. That's because they know porcelain-and-metal assemblies produced by Lapp offer an extra margin of operating security . . . long life . . . and low upkeep. Lapp porcelain adds value, because it adds dependability, to such equipment.

The porcelain-and-metal assembly of which Lapp has made more units than any other, is the 10″ suspension disc. This "simple design" has had more research and testing than anything else we have ever worked on.

We know, as do hundreds of power companies, that there's no surer way to build security and long service into a transmission line than to hang it on Lapp suspension insulators.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Day-Brite in the West, for the West



Faster, better service

Now, the new Day-Brite Santa Clara, California, plant is in full swing—speeding assembly, finishing and delivery of Day-Brite fixtures to Western and Intermountain areas.

This, coupled with the location of 9 Day-Brite representatives and 63 distributors in 31 major cities (see map), enables Day-Brite to render faster, more effective service to the West and Intermountain regions.

Before you decide on any phase of lighting or relighting, call your Day-Brite representative.

Day-Brite Representatives

Matt Cabot, Western Regional Sales Manager, Santa Clara, California

R. M. Camnitz
Portland, Oregon

J. H. Brundage
San Francisco, California

Alan Humphrey
Fresno, California

H. R. Chilton
Los Angeles, California

The Edward L. Peterson Co.
San Diego, California

R. E. Tweedy
Phoenix, Arizona

Stevens Sales Company
Salt Lake City, Utah

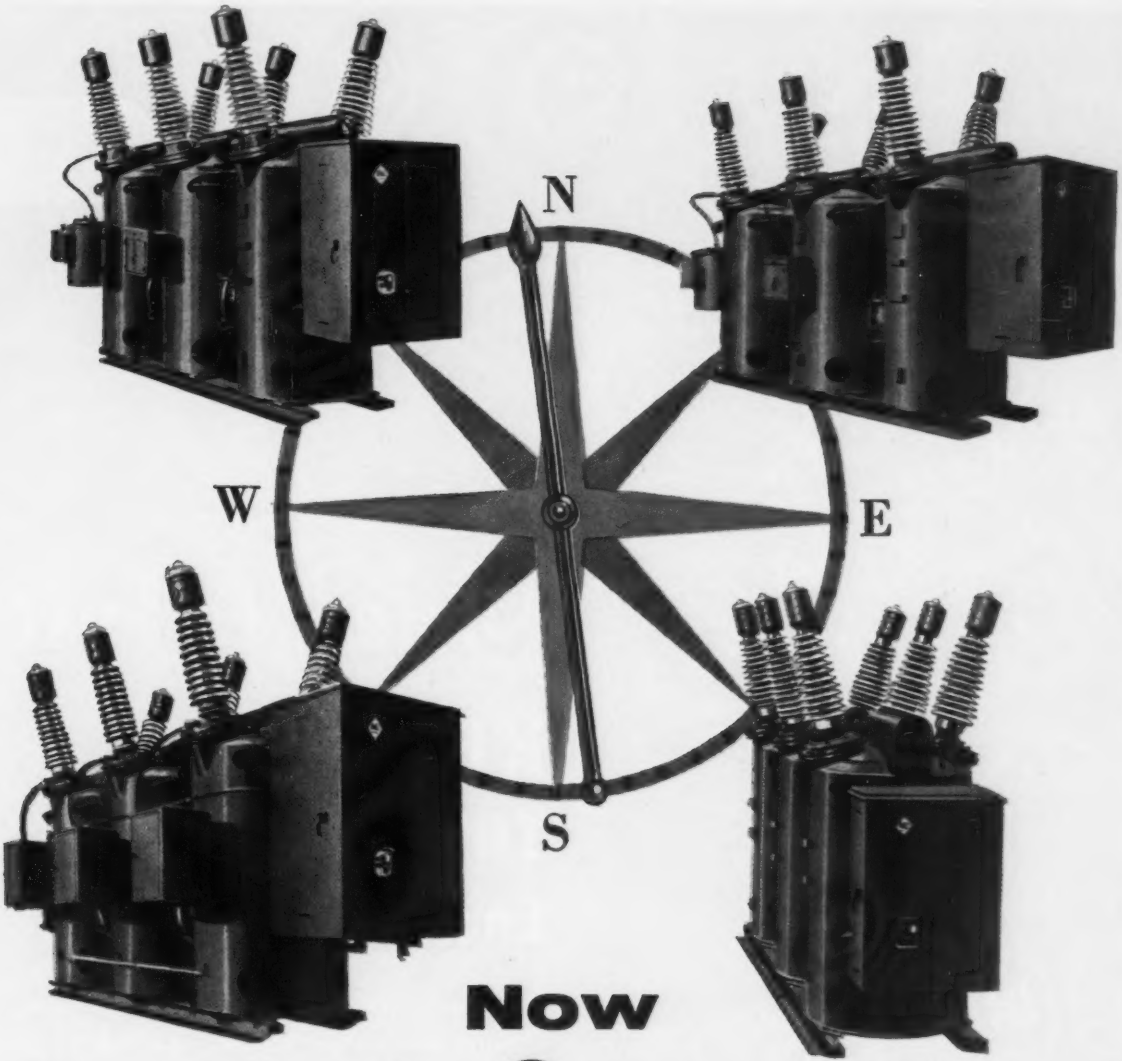
C. D. Belt & Company
Denver, Colorado

Day-Brite Lighting, Inc.
5412 Bulwer Ave.,
St. Louis 7, Missouri

DECIDEDLY BETTER DAY-BRITE Lighting Fixtures

61114

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT



Now *Pneu-Draulic* Operators

used on ~~30~~ 39 Power Systems

In the last six months, 9 more power systems have installed Allis-Chalmers hydraulically operated circuit breakers.

This is remarkable acceptance and it's due to several reasons. *Pneu-Draulic* operators are both simple and reliable . . . and they eliminate such common operating problems as moisture, condensation, dust and dirt.

Repeat orders are growing, too. This in itself is proof of the excellent performance of breakers with these operators under a wide range of field conditions.

Isn't it time you try an Allis-Chalmers breaker with *Pneu-Draulic* operator on your system?

Get information from your nearby A-C office or write for Bulletin 71B7942. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

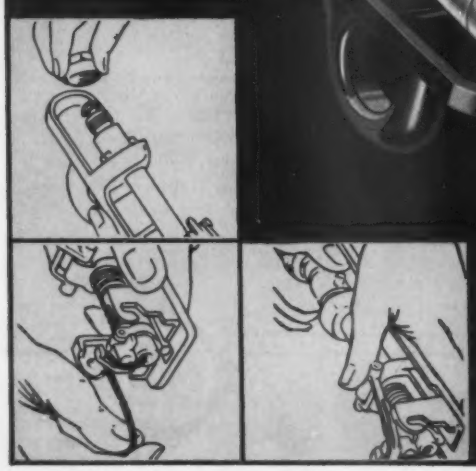
ALLIS-CHALMERS

A-4972

Easiest... Fastest to Fuse

KEARNEY TRIP-O-MATIC Enclosed Cutouts

Linemen like the Trip-O-Matic because it's so easy to fuse . . . particularly with gloves on. There are no nuts or bolts to tighten. Simply thread a standard buttonhead fuse link through the top of the cartridge . . . tighten the cap . . . pass the fuse link cable under the spring pressure toggle . . . place door on box, and close. This exclusive KEARNEY construction maintains proper fuse link tension without excessive strain on the link.



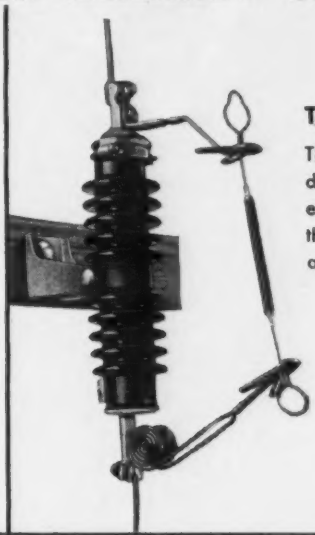
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

Whatever YOUR PRIMARY PROTECTION NEEDS . . .

YOU CAN RELY ON KEARNEY CUTOUTS

TRIP OUT . . .

New TYPE "G" provides revolutionary *front venting* to eliminate contact burning. New upper contact construction "rolls with the punch" to absorb impact harmlessly.

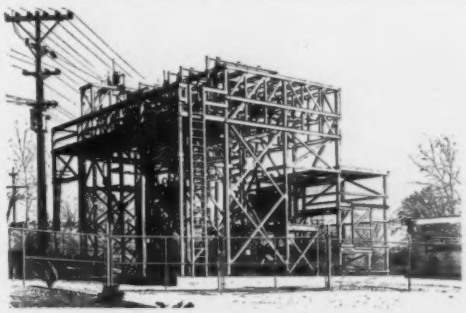


TRIP-O-LINK . . .

The proven, practical design using a single, easily replaceable unit that combines fuse link and cartridge.

TRIP SAVER . . .

Three-shot reclosing type cutout that aids greatly in maintaining service continuity.



CUTOUTS FIELD TESTED . . .

Here at KEARNEY's Substation Laboratory of 150,000 KVA Transformer Capacity—with a back up power of 445,000 KVA all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings . . . not just theoretical calculations. You can be sure they will do the job they are supposed to do . . . with a generous margin of safety.

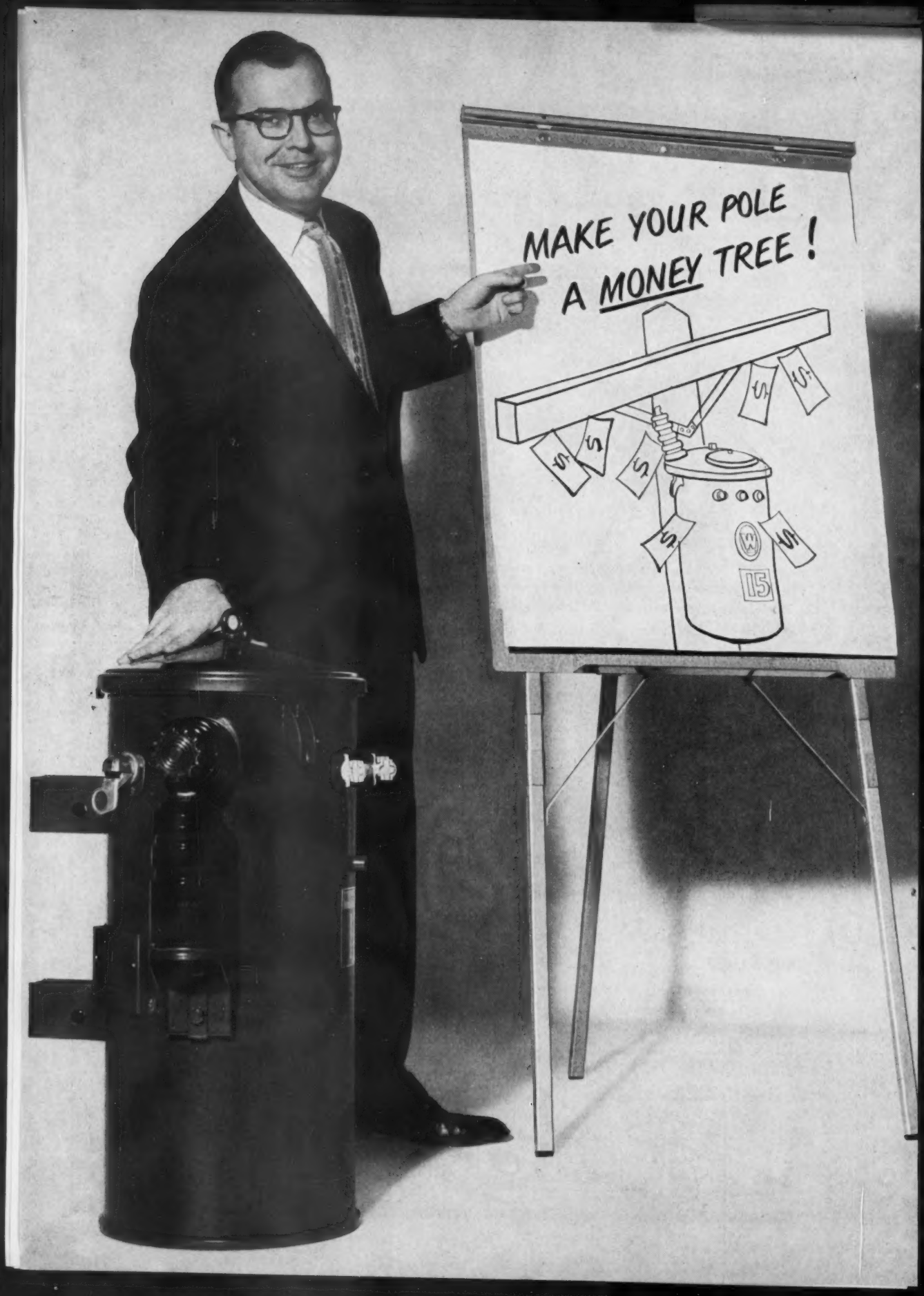
-309

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY PRODUCTS

JAMES R. KEARNEY CORPORATION ST. LOUIS MO. EVELETH, MINN.

The Mark of Quality

MAYDWELL & HARTZELL, INCORPORATED • WEST COAST DISTRIBUTORS


MAKE YOUR POLE
A MONEY TREE!
15

Increase transformer overload capacity 20%

. . . without sacrifice of service life

Bold pioneering with a new system of Life-Testing now reveals how much heat modern Westinghouse transformers can take—and still deliver continuous service. Applied to the 1956 line of Westinghouse distribution transformers, it means simply this —greater, longer overloads, *without sacrifice of normal service life.* In addition, it offers a welcome reduction in costly emergency service calls.

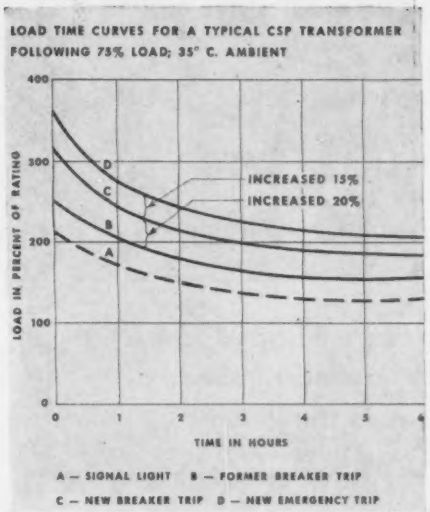
NEW "CSP®" TRANSFORMERS—Higher breaker settings boost overload capacity an average of 20%. Drastically reduced breaker trip-outs, greater flexibility in timing of change-outs . . . all this is available in the new Westinghouse "CSP" transformers because breaker settings have been stepped up to take advantage of the extended safe range. These new settings are based on 18 months of laboratory life-testing, backed up by as much as three years of field experience by three utilities.

NEW CONVENTIONAL TRANSFORMERS—Available with new TD indicator to take guesswork out of loading. All the advantages proved by Functional Life-Testing are offered in conventional transformers, and in addition:

Now, for the first time, they can be loaded for peak efficiency. Because the new TD indicator keeps an accurate and permanent record of overload hours, the two extremes of burnouts in some locations with wasted capacity in others can easily be avoided. This is an effective tool for load management.

The combined effect of newly proved thermal endurance and the efficiency of loading substantially increases conventional transformer economy.

For further information on the all-new lines of distribution transformers, call your nearest Westinghouse representative, or write direct to Westinghouse Electric Corporation, P. O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-70761



Higher breaker settings on the new "CSP" transformer give 20% more sustained overload capacity without sacrifice in transformer life, additional 15% emergency range. Signal light remains at standard ASA setting.

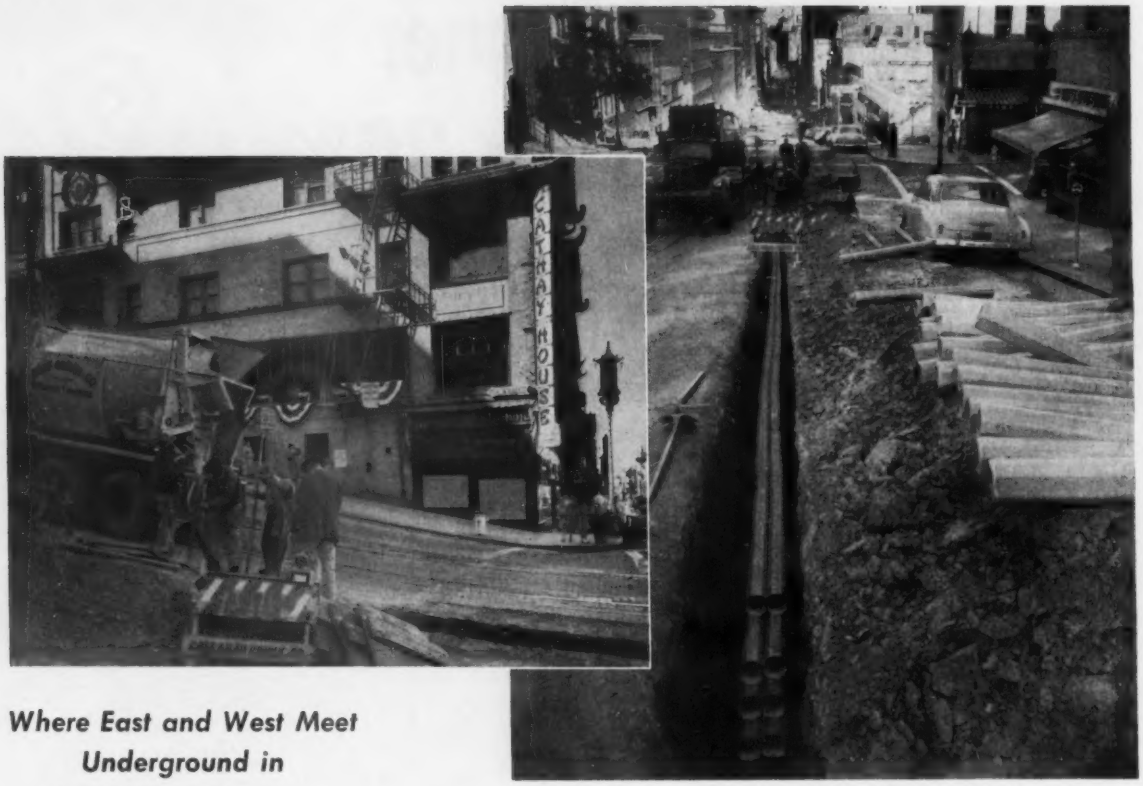
A cumulative overload record. Signal light shows when unit is overloaded on the basis of copper temperature; dial records total hours of overload experienced. Easily read from the ground. Can be reset.

◀ Bob Wagner, Manager, Distribution Equipment Sales, dramatically points out that there's more money on the line for utilities using the new Westinghouse distribution transformers.

YOU CAN BE SURE...IF IT'S

Westinghouse

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver



Where East and West Meet Underground in in San Francisco . . .

OCT-O-DUCT SAVED TRENCHING, TIME AND TROUBLE

To get the full OCT-O-DUCT story, send for this new 12-page catalog.

From the top of San Francisco's many splendored Nob Hill, down rock-ribbed California Street to bustling, colorful Chinatown, an 8-tier run of Soapstone OCT-O-DUCT provides a new, vital telephone link.

During construction a steady traffic stream of autos, trucks and cable cars flowed up and down this precipitous thoroughfare, where grades reach 18.18 percent.

Further to complicate installation—beneath the street is almost solid rock, laced with numerous water, gas and sewer pipes at varying elevations. A narrow trench, 5½ feet deep was required.

Little wonder, then, that OCT-O-DUCT was chosen for this installation. Its short, easy to handle, 4-foot lengths, its flat sides, which enable tiering with *no* spacers, and its flexibility in by-passing underground obstructions combined to speed the project to early, economical completion.

Now, safely encased in a sturdy concrete sleeve, the eight OCT-O-DUCT runs will give dependable, permanent protection to important telephone cables in the heart of San Francisco.

Please send me a copy of your new Soapstone OCT-O-DUCT catalog.

Name .....

Position .....

Company .....

Street .....

City ..... Zone .... State .....

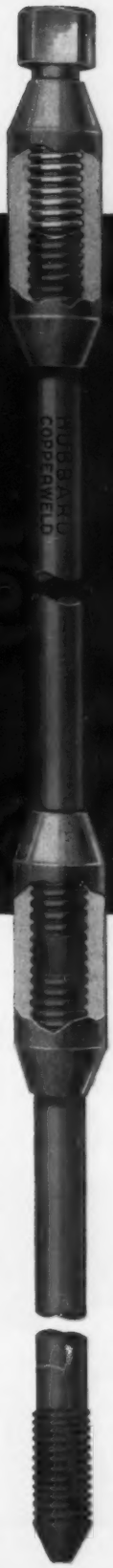
SOAPSTONE DUCT COMPANY

3985 Beach Street, Oakland 8, California

Distributed in the West by

MAYDWELL & HARTZELL, INC.

San Francisco, Los Angeles, Phoenix, Portland, Seattle, Spokane



DRIVE DEEP!

Seasonal variance in water table levels for a given locality is a factor of prime importance in efficient grounding. This fluctuation has a definite relationship to permanent moisture levels which must be reached and maintained for grounding rods to be effective. Deep grounding procedure coupled with regular testing provides a sound basis for maintaining maximum protection for equipment and personnel, as well as continuity of service.

That's because deep grounding assures you of a good connection with permanently moist, low resistance soil. Lets you work to a standard of low resistance that gives maximum dependability to the performance of your protective equipment.

Hubbard Copperweld sectional ground rods are made especially for deep grounding. They are designed so that additional sections may be added as needed to reach the depth of permanent moisture and the proper standards of resistance. And they're Molten-Welded, an exclusive process that makes Copper and Steel perform as a single solid unit, yet gives the high conductivity and corrosion resistance of Copper and the strength of Steel.

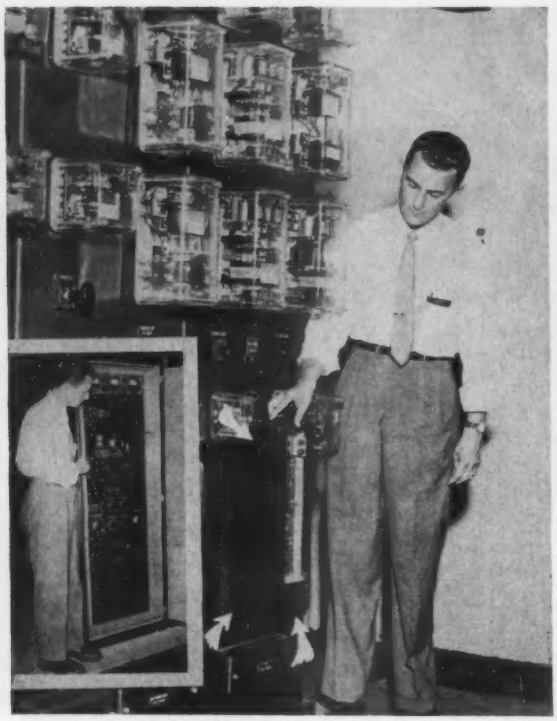
Your Hubbard distributor carries complete stocks of Copperweld sectional ground rods. Contact him. Meanwhile, if you haven't already received a copy, write for Practical Grounding, an informative handbook of grounding principles and practices, and complete details on how it works.

HUBBARD AND COMPANY

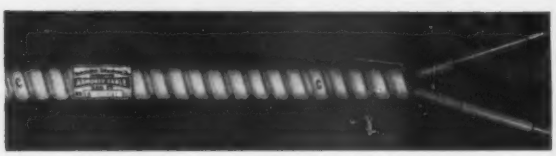
6301 Butler Street
Pittsburgh 1, Pa.

PRODUCT NEWS

New Designs and Applications



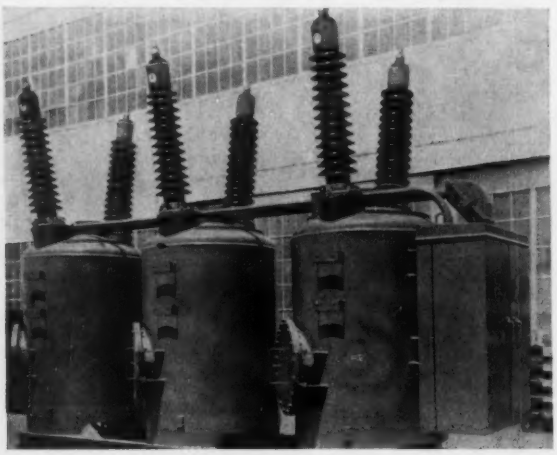
(1) PICTURED IS WHAT IS REPORTED to be the first fully transistorized power line carrier equipment. Designed and built by Westinghouse Electric Corp., the assemblies are now in full operational service in the Potomac Edison Co. system in Maryland. Reported advantages include a 50% reduction in installation time, savings in space and sharply reduced operating and maintenance cost. It consumes only 18 w of power, as compared with 250 w used by conventional assemblies; uses only 1 cu ft of substation space. Note the relative size of older equipment in insert. New unit is mounted directly on relay panel



Armored Cable

(2) Columbia Cable & Electric Corp., 255 Chestnut St., Brooklyn 8, N. Y.

Thermoplastic insulated conductors together with a bonding strip are employed in this new UL-listed armored cable. Conductors are permanently color coded, and each conductor has a treated paper sheath for additional protection. Protection provided by the bonding strip is now available on all sizes up to and including No. 2 AWG assemblies.



Oil Circuit Breaker

(3) Federal Pacific Electric Co., Pacific Switchgear Division, 5815 Third St., San Francisco 24, Calif.

This company announces a new oil circuit breaker that is rated at 1,500 mva for 115-kv, 800-amp service. It features a two-break rotary design with type OA-4 hydraulic operating mechanism. The breakers are skid mounted and shipped with bushings in place. The manufacturer reports that the new design facilitates adjustment and maintenance, and contributes to unusually quiet operation during five-cycle operating time. The new breaker is designated type JHE-54.

(4) NIAGARA MOHAWK POWER CO. has made the first use of bare aluminum as aerial power cable sheathing in the U. S. Use of aluminum instead of lead produced a sheathing reported to be six times stronger and one-fifth as heavy. Here the application is a turn with extruded aluminum dead-end clamps holding cable at the ends. Inset shows a typical midspan splice. The new technique permitting aluminum sheathing to be joined with welds without damage to cable insulation was devised by Mohawk Power from information supplied by Aluminum Co. of America

17 Years of continuous service

prove Kuhlman Porcelain Enamel Transformers give positive protection against salt spray and corrosion

Utilities have used Kuhlman Porcelain Enamel Transformers since 1938. They report no deterioration in the enamel finish after 17 years of continuous service.

These units, serving in areas of heavy salt spray and industrial corrosion, have proven that Kuhlman porcelain enamel is far superior to ordinary finishes which corrosive atmospheres destroy in a short time. In every reported case, Kuhlman's exclusive finish is saving maintenance and repainting costs—shows no signs of rusting, cracking, or fading under the most severe conditions.

It is no wonder that Kuhlman porcelain enamel resists corrosion. Unlike paint, it is permanently fused to the tank metal at 1500° F forming a glass coating three times the thickness of ordinary paint. The resulting rock-hard surface makes an attractive, durable transformer finish—guaranteed to give you long life corrosion-free service.

For more facts about Kuhlman porcelain enamel transformers, write or ask for bulletin PB-140.

YOU GET THIS POSITIVE PROTECTION:

- Non-Corrosive external hardware

- Well protected support lugs

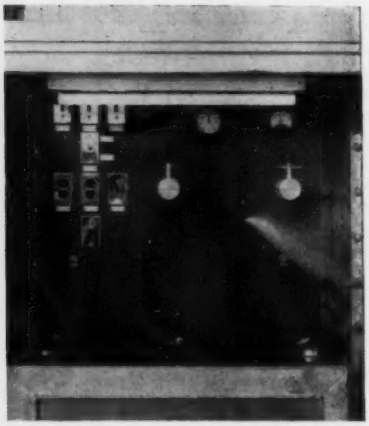
- Protected seams, welds, and bushing openings

- Heavy coating on the bottom of the tank

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

DISTRIBUTED BY MAYDWELL & HARTZELL, INC. Seattle • Spokane • Portland • San Francisco • Los Angeles • San Diego • Phoenix



(5) ELECTRICAL CONDUCTOR PRODUCTS of Kaiser Aluminum & Chemical Corp. are being exhibited in this specially designed trailer at industry meetings, conventions and exhibitions across the nation. Also on display are accessories produced by various manufacturers. The trailer is also a mobile laboratory for demonstration of proper and improper practices in the use of aluminum conductor (see small photo). Spectators may operate the timing mechanism to see point where insulation breaks down

Hydraulic Boom

(6) Pitman Mfg. Co., 300 W. 79th Terrace, Kansas City, Mo.

The model 60 Pitman Hydro-Lift, a redesigned Model B, telescopes hydraulically with a 6,400-lb load. Designed for mounting on two-ton or larger trucks, the equipment comes complete with hydraulic cylinders, load-line winch, hydraulic pump, sheaves and cable, hydraulic tubing, all assembled for installation.

Street Lighting Standard

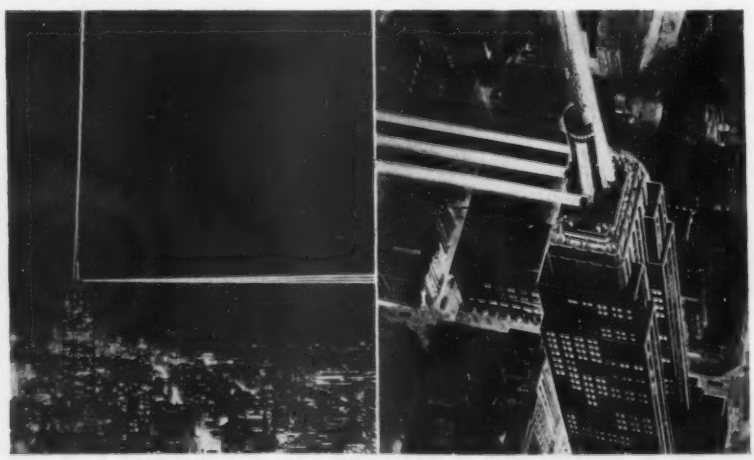
(7) Millerbernd Mfg. Co., Winsted, Minn.

This company's Elite street lighting standard is designed for the new slip-fitter type of fluorescent luminaire. Available in all popular mounting heights. Full data are available on request.

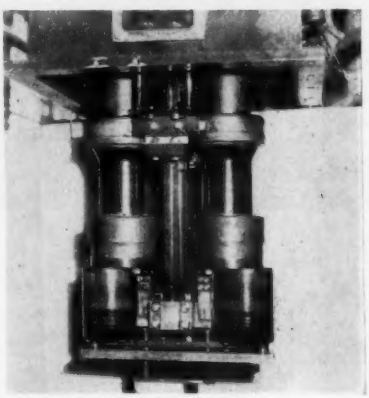
Diaphragm Pump

(9) Homelite Division, Textron American Inc., 75 Riverdale Ave., Port Chester, N. Y.

With a stated pumping capacity of 5,000 gal per hour, this new heavy-duty diaphragm pump is finding use in utility construction work. Called Model 20DP3, it weighs only 120 lb and is said to run six hours on one gallon of gasoline at full capacity. Has adjustable speeds.



(8) THIS IS HOW THE Empire State Building looks with four beacons putting out nearly 2 billion candle power. Federal Sign & Signal Corp., Chicago Daily News Bldg., Chicago 6, installed the complex set of beacons. The beacons revolve 180° horizontally and swing 90° vertically



Load Tap Changer

(10) Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.

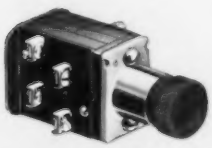
This manufacturer announces a load tap changer capable of handling transformer banks up to 1,300,000 kva for 20% range in 32 steps. This makes higher through-power ratings of load tap changing transformer banks possible, to meet requirements of future heavier transmission systems.

Apparatus Bushings

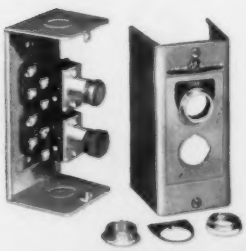
(11) Ohio Brass Co., Mansfield, Ohio

The range of O-B small diameter, lightweight apparatus bushings has been extended to include 230-kv operating voltage. In this new group, the insulating core is surrounded with oil from end to end. Ratings from 115 kv to 230 kv are equipped with oil level gages and capacitance taps.

ALLEN-BRADLEY
HEAVY DUTY PUSH BUTTONS



Bulletin 800 heavy duty STOP button ready to mount in enclosure. (See below)



A small stock of standard components lets you assemble any special heavy duty station. There is no waiting for special push button stations.

These new Bulletin 800 heavy duty push buttons are the modernized version of that old reliable line of A-B heavy duty stations. Advantages—until now restricted to the oiltight stations for machine tool use—have been built into these new heavy duty stations—and you'll like the result.

For instance, each button or pilot light is a self-contained unit which can be mounted singly or in groups—vertically or horizontally—in a variety of standard Allen-Bradley enclosures, with the name plate reading in the right direction. Double break, silver alloy contacts used throughout. Send for Bulletin 800.

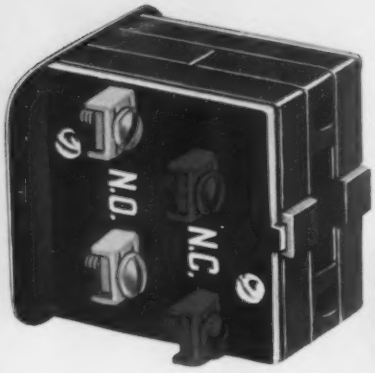
Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

In Canada
Allen-Bradley Canada Ltd., Galt, Ont.

A-B Quality

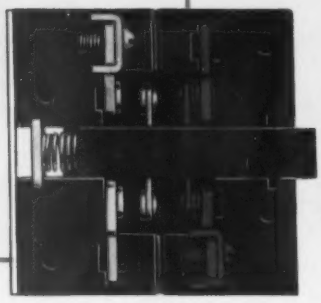
ALLEN-BRADLEY
QUALITY
BULLETIN 800 PUSH BUTTONS

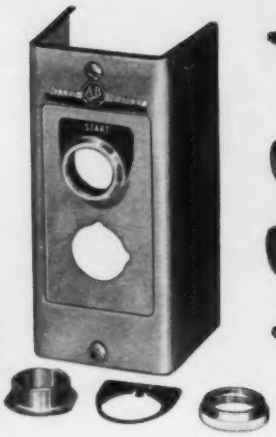
5-56-MR

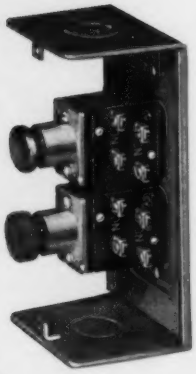


Left—External view of contact block showing N. O. & N. C. terminals.

Right—Internal view of contact block showing double break N.O. & N.C. stationary contacts. The pushrod carries the moving contacts.

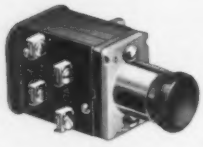




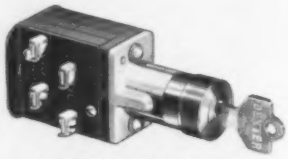


Two button station with name plate and clamping ring removed from cover.

A NEW LINE OF ALLEN-BRADLEY HEAVY DUTY PUSH BUTTONS

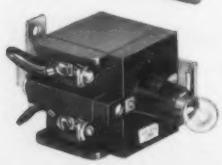


Type AK1B flush head START button



Type EK11B cylinder lock unit

Type HK11B wing lever selector switch unit



Type PK16 pilot light with 110 v, 60 cy. transformer. Available with 220-440-550 v, 60 & 25 cy. transformer

Allen-Bradley heavy duty push buttons have been redesigned to take advantage of the type of construction that has made A-B oiltight machine tool stations so popular.

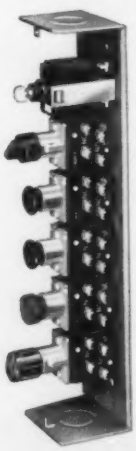
While the new Bulletin 800 heavy duty line is not oiltight, it uses contact blocks that have proved so dependable in the Bulletin 800T oiltight push buttons. Special heavy duty stations can be assembled on the job from a small stock of standard components.

Several types of operators are available, such as standard head, mushroom head, coin slot, key type, wing lever, and 2 or 3 position selector switches. The buttons can be supplied in different colors.

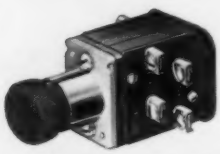
These push button stations can be easily arranged for either vertical or horizontal mounting —with the name plates reading correctly for the desired mounting.

Standard enclosures accommodate up to 8 buttons and pilot lights. Enclosures for more than 8 units can be supplied. Write for Bulletin 800.

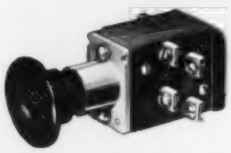
Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.
In Canada
Allen-Bradley Canada Ltd.
Galt, Ont.



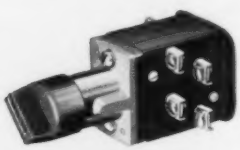
Five button station with pilot light



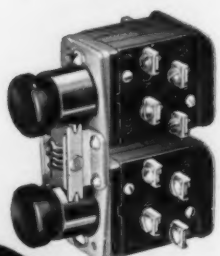
Type BK6B ext. head STOP button



Type DK6B mushroom head button



Type HK2B selector switch



Type FK2B 2 button interlocked station

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

5-56-MR

Published in the interest of the Soft Drink Canners Association and the canning industry.

No headaches in these drinks!

Eliminate the hazard of broken bottles in your plant by providing your employees the safety and convenience of canned soft drinks.

Call your soft drink supplier and learn the many advantages of dispensing drinks the modern way—in cans.

QUALITY YOUNGSTOWN SERVICE

Above are illustrated two of the modern cans for soft drinks, now available for in-plant use.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

DISTRIBUTION TRANSFORMERS

THIS BOLT

COULD SAVE YOU...$3,000

Estimate your possible savings in terms of all transformers on your lines

When the neutral terminal on a 25-kva transformer broke, it put 240 volts across the 120-volt lines of several customers of a Northwestern utility. Result? Nine irate customers sued the utility for about $3000 worth of ruined household appliances.

This was an unusual situation, of course. But ordinary terminals sometimes crack, and the results can be serious. The usual villain is stress-corrosion, initiated when a lineman tightens the terminal clamp close to the metal's yield point. Corrosive elements go to work and eventually the terminal clamp breaks, dropping the line and bringing customer complaints.

G-E Strenicor terminal clamps can save you that expense. Designed to be 100% resistant to stress-corrosion, the clamps are practically immune to failure. Forged from a new copper-nickel-silicon alloy—Strenicor—G-E clamps have a tensile strength of 107,000 psi, and will resist corrosive atmospheres that cause failure in ordinary copper alloys.

Look at the other money-saving features that prove "all transformers are not alike": **Impulse testing,** for instance, saves years of transformer life. **One-piece clamping bands** save maintenance time. Reusable Nitrile rubber gaskets help save units from contamination. **AL/CU terminals** are designed to prevent both copper and aluminum conductors from loosening. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431-37, Schenectady 5, N. Y.

dollar-saving features prove ATANA*

*ALL TRANSFORMERS ARE NOT ALIKE
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

Progress Is Our Most Important Product

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

NEW KILLARK

EXPLOSION-PROOF LIGHT FIXTURE

Series "H" Fixture combines excellent lighting efficiency with cooler operation, greater safety, easier installation and maintenance.

NEWLY-DESIGNED SERIES "H" FIXTURES HAVE THESE OUTSTANDING FEATURES:

BETTER LIGHTING—Auxiliary anodized aluminum reflector increases light output, resulting in more efficient distribution of light.

SAFER LIGHTING—Cooler operation increases safety factors; rugged construction confines explosions within system.

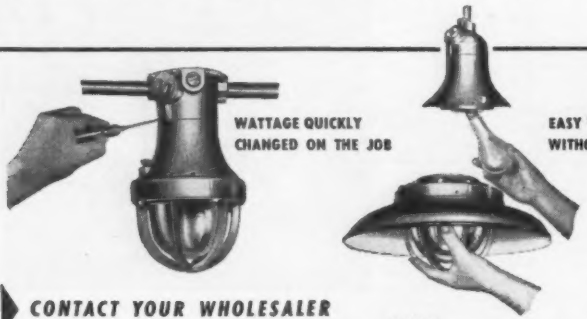
STREAMLINED—Attractive, compact. No ledges to catch dust.

LIGHTWEIGHT—Made of non-rusting, non-sparking aluminum alloy.

EASY RELAMPING—No tools needed.

WATTAGE QUICKLY CHANGED ON JOB—All sizes fit standardized splice boxes.

U. L. APPROVED—Listed by U. L. for Class 1, Groups C & D locations.



WATTAGE QUICKLY CHANGED ON THE JOB

EASY TO RELAMP WITHOUT TOOLS

CONTACT YOUR WHOLESALER

DALLAS	1903 Griffin St.
DENVER	1073 Galapago
LOS ANGELES	412 Seaton St.
SAN FRANCISCO	714 Harrison St.
SEATTLE	4130 First Ave., S.
KANSAS CITY, MO.	616 W. 26th St.

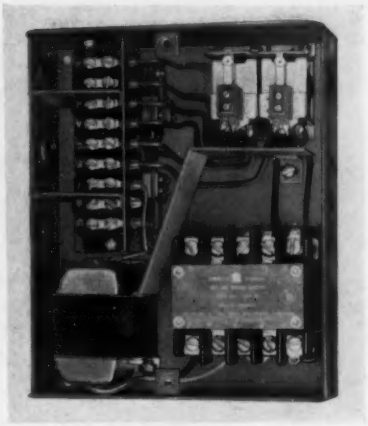
CANADIAN REPRESENTATIVES:

E. A. Adams, Griffon Sales, Ltd., 188 W. 5th Ave., Vancouver 10, B. C.

A. H. R. Louden Agency, 7608 88th Ave., Edmonton, Alberta

Killark ELECTRIC MANUFACTURING COMPANY

VANDEVENTER AND EASTON ST. LOUIS 13, MISSOURI



Conditioning Control Panel

(12) General Controls Co., Glendale, Calif.

Automatic centralized control of air conditioning systems is provided in this new master control panel. All components are in the unit and prewired to terminal blocks. Report is that time and labor are saved in installation and maintenance.

Capacitor Bank Control

(13) Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Socket mounted current controls with either a high- or low-voltage override offered by this company are designed to actuate oil switches for capacitor banks. When voltage is within a predetermined limit capacitor switching is accomplished by the current control. If voltage exceeds the predetermined limit, the voltage control will switch the capacitors to correct the condition. The current control can be adjusted for a minimum difference of ¼ amp between on and off settings anywhere on the 5-amp scale. It has a thermal element for time delay and a fuse-protecting control and load circuits. The voltage control has a 1½- to 12-v adjustable band width, 110- to 130-v operating range, a time delay of about 60 seconds, fuses for both load and control circuits and a lightning arrester.

Line Truck Steps

(14) Diesel Power Inc., Box 72, Greenville, Pa.

This company has developed a set of sturdy, fold-away steps that provide easier access from the ground to the bed of utility line trucks. When not in use, the steps fold under the truck frame.

FOR SPEED!

FOR ACCURACY!

USE BELL SYSTEM PRIVATE LINE TELETYPEWRITER SERVICE

Bell System private line teletypewriter service offers important advantages to those who operate the nation's power lines.

Teletypewriters are used for planning the day's operations, general written communications from load dispatcher to power plants, substations, other dispatchers, and offices.

The service ranges from a simple private line between two teletypewriters up to networks connecting many points. To meet the challenge of today's highly competitive market, you have *direct—fast—accurate—written—private—two-way* record communications.

Let a Bell System communications engineer make a detailed study of your communications. Such a survey may save you time and money. There's no obligation.

• ***Call your Bell Telephone representative***

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER TELEMETERING AND REMOTE CONTROL CHANNELS

WESTINGHOUSE

A DEPENDABLE COMBINATION

Westinghouse Bus Duct—made with Kaiser Aluminum Bus Bar—offers many advantages that result in better bus duct systems. Among these advantages are:

Application flexibility—Westinghouse Bus Duct using aluminum bar is normally applicable to all installations where duct using copper bar is currently used. There are distinct advantages to consider when comparing the use of aluminum with copper in any particular application.

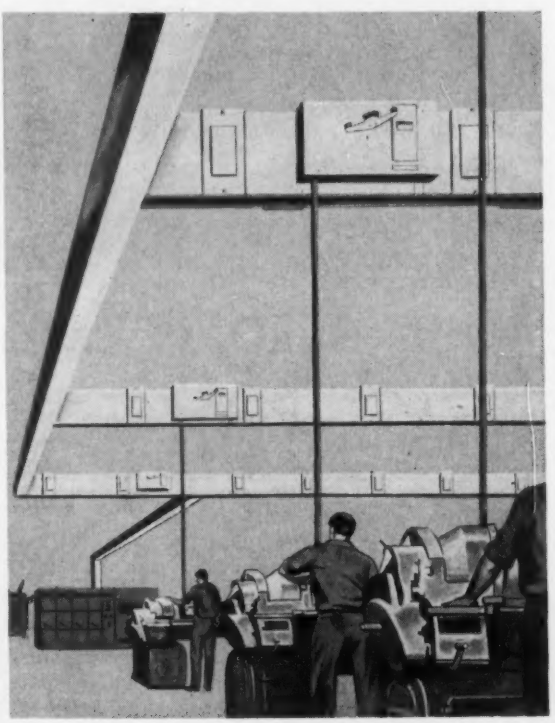
Up to one-third less weight—the cross-sectional area of aluminum bus bar for comparable current capacity is only slightly greater than that of copper bus bar. But, aluminum is a little less than one-third the weight of copper by volume. Thus, a 10-foot section of bus duct using aluminum bar is approximately 30% lighter than a 10-foot section of bus duct using copper bar.

Easier handling—Lighter weight and easier handling go hand in hand. Every step of the way from transporting to installing, personnel find the lighter weight of aluminum a distinct advantage.

Lower first cost—At present approximately 10% saving over equivalent copper duct can be realized. Increased use resulting in lower manufacturing costs will increase this saving still further.

Lower installation cost—This is primarily due to being able to handle bus duct using aluminum bar with greater ease. Less time is required to get the duct in place.

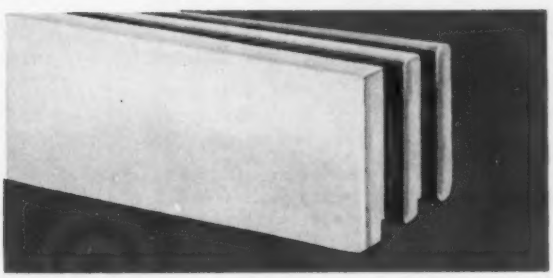
Lighter floor loading—This is another benefit of lighter weight of particular value when bus duct is used as part of a modernization program, especially when it comes to installing duct as vertical risers in commercial buildings. Aluminum bus duct is the answer.



In addition, Westinghouse has built in the same assurance of low resistance joints that are available in duct fabricated with copper bar. Each bar is electrolytically silver plated over its entire length to provide the same consistent low contact electrical resistance which

KAISER WIRE

FOR BETTER BUS DUCT SYSTEMS



is stable over long periods of time under varying operating conditions. In performance it is equivalent in every respect to copper bus duct and meets the same NEHA & U/L standards.

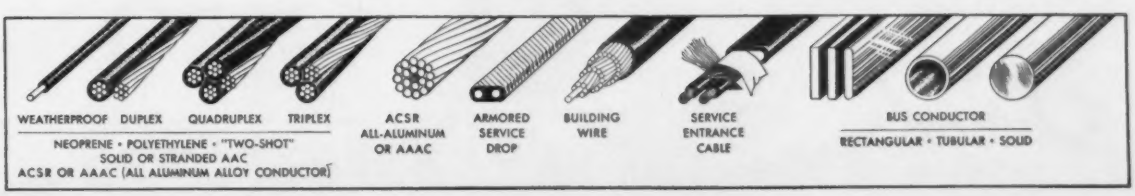
Detailed information on Westinghouse Aluminum Bus Duct can be obtained by writing to Westinghouse Electric Corporation, 3 Gateway Center P.O. Box 868, Pittsburgh 30, Pennsylvania.

• Aluminum's unique combination of useful properties make Kaiser Aluminum Bus Conductor ideal for use in industrial plants, commercial buildings, central stations and substations. Among its advantages are high conductivity, light weight, corrosion resistance, workability, strength, availability and economy.

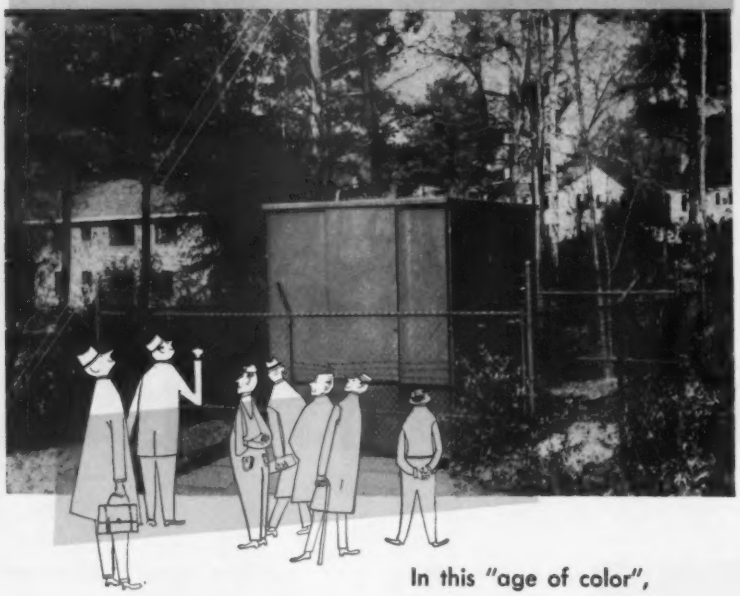
To assist manufacturers, utilities, architects and engineers in the conversion to aluminum bus, Kaiser Aluminum makes available a large range of shapes, alloys, and sizes of aluminum bus conductor—including rectangular, tubular, and solid round bus. Ask for free booklet "Kaiser Aluminum Bus Conductors"—containing valuable information on types and advantages, availability, electrical properties, physical properties, bending, corrosion resistance, joining, and silver plating.

Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum



CORROSION PROTECTION PLUS GOOD LOOKS



In this "age of color", managements are sensitive to the need for paint that is both anti-corrosive and decorative. Paint should not only preserve plant and equipment, it should also preserve the good will of neighbors and the enthusiasm of personnel.

Subox* and Subalox* paints do all this. They are the only paints in America made with Suboxide of Lead, therefore they provide excellent corrosion protection. And they are made in a wide range of metallic colors, and are effective indoors as well as outside.

Subox paints offer a complete paint system. Often the same variety functions as both primer and finishing coat and may even answer the need for reflectivity as well as radiation.

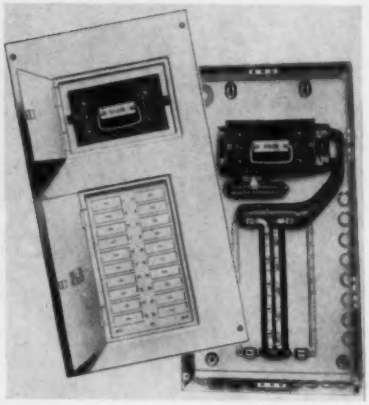
Send for color cards and data book "Subox Paints".

*Trade Mark

Subox Inc.

Established 1924
18 Fairmount Plant, Hackensack, N. J.

See Catalogues in Sweet's Industrial and Engineering Files



Service-Entrance Panel

(15) Wadsworth Electric Mfg. Co., Covington, Ky.

Advantages of both fuses and circuit breakers are said to be combined in this new service equipment. A 100-amp fusible main disconnect with provisions for 12, 16 or 20 circuit breaker circuits is contained. It is for three-wire service, solid neutral, 120/240 v a-c; has dead front construction.

Water Conditioner

(16) Packard Water Conditioner Division Inc., 2220 W. Beaver St., Jacksonville 9, Fla.

Prevention and elimination of scale and corrosion formations in boilers and water systems is said to be accomplished without the use of chemicals by a device announced by this manufacturer. Said to be the first important application of nuclear physics principles to industrial water problems, the water conditioner does its work by imparting added energy to the atoms of the water solution. Does not require maintenance or servicing and carries a 10-year warranty. Available in sizes to handle from 6.5 to 1,760 gpm.

Radiant Heat Panels

(17) Heatmore Inc., 59 Throop Ave., Brooklyn 6, N. Y.

Ceramic radiant heat panels that can be suspended from the ceiling are available from this manufacturer. For use wherever saving wall and floor space is a prime consideration. Can be used for commercial and industrial applications.

For More Data Fill in Coupon, Page 53

FEDERAL PACIFIC'S
YVH AIR SWITCHES
OFFER YOU...

"Built-in" Dependability

FPE
FEDERAL PACIFIC ELECTRIC

DESIGN simplicity plus quality features insure outstanding performance!

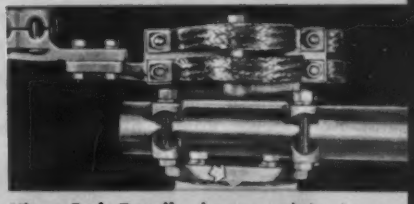
Simple: A basically simple, but highly efficient design, engineered to insure continuous, trouble-free operation.

Easy to adjust: Cut-and-try eliminated! Only two steps for a completely adjusted switch unit.

Easy to install: Lighter weight; shorter overall lengths; blades counter-balance each other.

Easy to operate: Engineered to provide mechanical advantages in and near the closed position. Stainless steel pins, and ball-and-socket connections.

Federal Pacific YVH outdoor group-operated rotating-insulator center-break air switches are available for horizontal, underhung or vertical mounting in 46, 69, 115, 161, and 220 kv sizes; 600 and 1200 amp continuous ratings; 20,000; 40,000 and 61,000 amp momentary ratings; ASA and NEMA standards. For complete details write for Catalog No. 4-142: Pacific Electric Switchgear Division, 5815 Third Street, San Francisco 24, California.



Hinge-End Detail: Arrow points to single-line rocker support. Selective tightening of cap bolts on each side of rocker provides complete alignment of contacts.

Contact Detail: High pressure is applied by beryllium-copper cantilever spring leaves.

Finest Products Engineered

FEDERAL PACIFIC ELECTRIC

COMPANY

50 Paris Street, Newark 1, N. J.

FANNER
Superformed
LINEGUARDS
provide lowest cost protection on SHORTSPAN CONDUCTORS

Fanner Superformed LINEGUARDS give short span distribution lines complete protection against abrasion, arcover, or clamp or tie wire damage at lowest possible cost. They have the same features of ease of installation, lasting durability and reuseability as Fanner ARMOR RODS, but are smaller in wire size and shorter, therefore cost far less: It's good economy to use Fanner LINEGUARDS on short spans with low tensions (1) at support points to protect against clamp or tie wire damage, (2) to provide a protective layer for tapping purposes, (3) at expulsion-gap or other critical locations. Further information and prices on FANNER Superformed Lineguards will be furnished on request. Write today.

Other FANNER ELECTRICAL LINE PRODUCTS

ARMOR RODS	PATCH RODS	TAP ARMOR	PLASTIC FANNGUARDS
• For protection against vibration damage and also good for emergency repairs on partially broken overhead lines.	• Act as a "repair sleeve" for conductors having up to about ¼ of the wires broken in the outer layer.	• Provides a protective layer of shortened rods on conductor for making taps without risking damage to conductor.	• Tough, durable spiral wound plastic sleeves that snap together over covered wires and cables to provide protection against tree abrasion.

Licensed for use under Patent No. 2,275,019

Fine Fanner Superformed

THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park Established 1894 Cleveland 9, Ohio

AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

Armor-Rod Tools

(18) James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo.

Two new armor rod installation tools are available from this manufacturer. Carriers are one-piece construction; dies are bronze. Available in sizes for 6 to 4/0 and 6 to 666.6 MCM ACSR.

Accounting Machine

(19) Underwood Corp., 1 Park Ave., New York 16, N. Y.

Designed to bring big machine features to smaller business organizations this new accounting machine provides a choice of three simplified methods for billing accounts receivable; is said to fit smoothly into existing bookkeeping systems and procedures. Also handles pay roll, accounts payable, inventory and other accounting functions.

Transformer Carriage

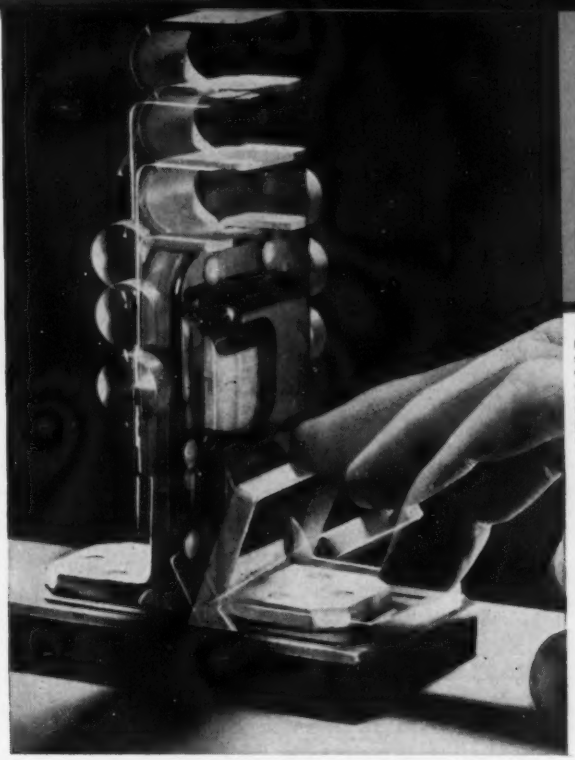
(20) Hesse Carriage Co., 1720 Cherry, Kansas City, Mo.

This company is producing an equipment handling carriage that is especially designed for easy transport of transformers up to 75 kv. Called the Transcarriage 75, it is equipped with inflated rubber tires and roller bearing wheels and will make 90° turns. Has a stated capacity of 1,250 lb and is equipped with loops to secure the load.

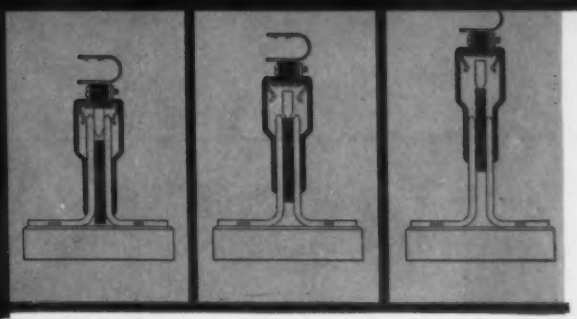
Power Capacitor

(21) Sangamo Electric Co., Springfield, Ill.

This company has added a 50-kvar rating to its line of power capacitors. The units can be mounted in standard racks, and have same base dimensions as the 25-kvar units. Ask for bulletin 1121.



The Vacu-Break action is shown by a manually actuated demonstration model of a switch-head. A section of the arc-restricting chamber has been cut away to picture the operation.



1. "ON" POSITION—head has been thrust down on stationary line and load contacts. Contacts engage a self-aligning copper slug, completing circuit and reinforced by the Clampmatic pressure spring to assure a bolt-tight contact.

2. SWITCHING TO "OFF"—head is carried swiftly upward by operating bail, aided by Clampmatic® pressure springs. Arcs are smothered instantly because oxygen and ionizable gas in chamber are restricted.

3. FULL "OFF" POSITION—stationary line and load contacts are completely covered and remain in slots of chamber, assuring positive alignment and maximum safety. Chamber also acts as seal against dust and dirt.

Switch to Vacu-Break Clampmatic

FOR SWITCHING SECURITY, LONGER PRODUCT LIFE

BullDog design controls arcing, eliminates costly maintenance!

Safety, efficiency, economy! When you want these operating advantages in safety switches, bus plugs, power panels and switchboards, turn to BullDog Vacu-Break Clampmatic®.

These famous BullDog products earn superior performance ratings with BullDog's trio of design exclusives: (1) Vacu-Break arc control smothers arcs to minimize pitting and burning—thus eliminating maintenance caused by excessive arcing. (2) Clampmatic action provides bolt-tight contact pressure. (3) Dependable switching mechanism guarantees positive switching security.

A switch to Vacu-Break Clampmatic is a switch to greater safety, longer product life, no costly maintenance. Consult your qualified electrical contractor or BullDog field engineer, or write BullDog Electric Products Company, Detroit 32, Michigan. © BEPCO

IF IT'S NEW... IF IT'S DIFFERENT... IF IT'S BETTER... IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY

A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, N. Y. • *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Road, Toronto 15, Ont.

CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

COAST ELECTRIC & MANUFACTURING CO.
1733 N.E. Seventh Avenue, P.O. Box 7712
Portland 12, Oregon

YOUNG ELECTRIC & MFG. CO.
2134 Curtis St.
Denver 2, Colorado

SAFETY SWITCHBOARD COMPANY
910—89th Avenue
Oakland 21, California

BULLDOG ELEC. PROD. CO. OF LOS ANGELES
2885 E. Washington Blvd.
Los Angeles 23, California

FLORIDA POWER & LIGHT SELECTS S&C POWER

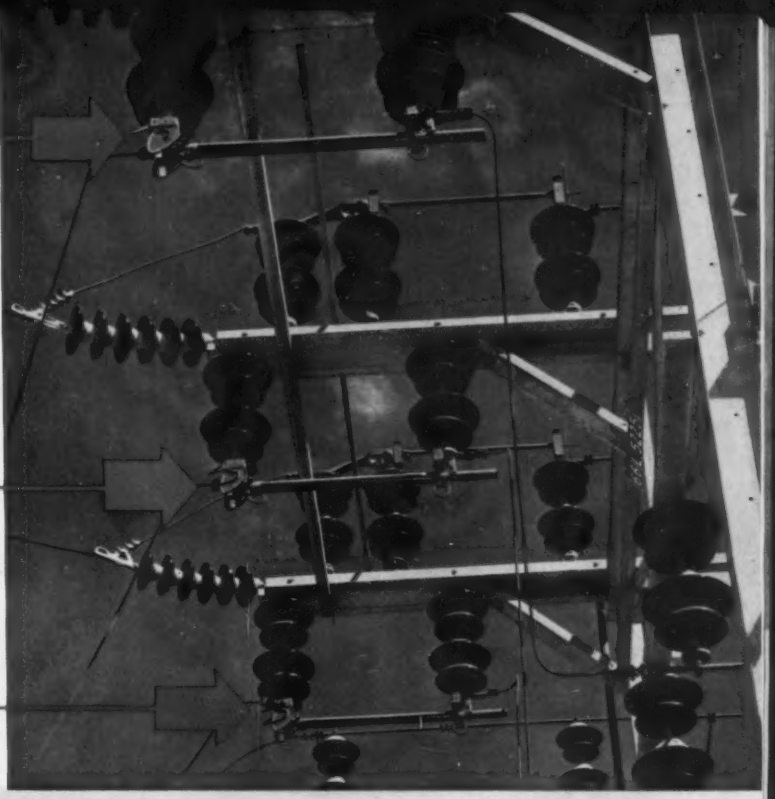
Florida Power & Light Company is the Sunshine State's fastest growing utility. Year after year more manufacturers, more businesses, and more commercial enterprises are moving into the territory it serves. Rapid population gains have increased customers by 138%, and more than tripled demands on the Florida Power & Light system since the end of World War II.

To satisfy these demands, Florida Power & Light has carried on an extensive power expansion program which, by the end of 1955, will have required the investment of $250,000,000 since V-J Day.

For an expansion program of such importance, it is only natural that the greatest possible care is used to make sure that service continuity is maintained and system equipment is protected.

Aerial view of the Hialeah section of Miami—one of the areas where rapid building of homes and industry has increased demand for light and power to six times what it was ten years ago. Hialeah Park is nationally famous . . . open the year around . . . host to hundreds of thousands annually.

COMPANY FUSES



For example, S&C Drop-Out Power Fuses—Type SMD (marked by arrows, right) are installed at Hialeah substation to protect two 7500 kva 69/13 kv transformers which serve Hialeah Park as well as the hundreds of homes and many small industrial plants which surround it.

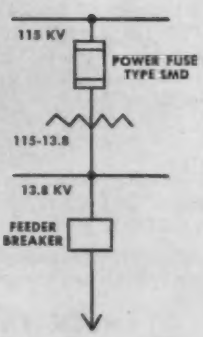
How S&C Power Fuses Are Used in the 69 Kv and 115 Kv System Protection Schemes

The transmission lines of Florida Power & Light Company are tapped at intervals to feed distribution substations. As was originally planned, the power transformers were not always provided with primary protection against secondary faults since primary breakers could not be economically justified.

After a 115 kv power transformer had been lost (for lack of such protection) the matter of protection was reconsidered. It was then decided that this protection was essential and that the device selected must meet these special requirements.

1. Provide system protection over a wide range of fault currents.
2. Coordinate with the transformer damage curve to provide maximum protection to the transformers.
3. Give complete coordination with secondary protective devices over the full range of fault currents.
4. Be capable of withstanding the recovery voltages which might be encountered under various fault conditions.
5. Be low in cost.

S&C Power Fuses, Type SMD, were found to meet all these requirements. Further details of Florida Power & Light's application of these fuses may be found in AIEE Paper No. DP 55-405.



Typical substation tapped directly from Florida Power & Light's transmission lines.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4425 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

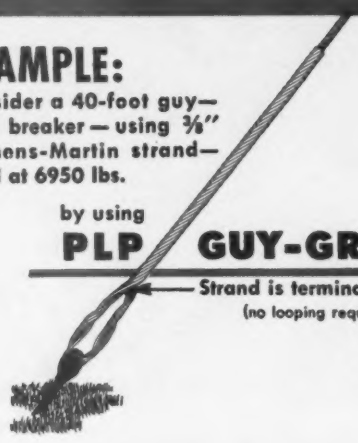
POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

HERE'S ANOTHER WAY...

Preformed Guy-Grips
CUT GUYING COSTS!

EXAMPLE:
Consider a 40-foot guy—with breaker—using ⅜" Siemens-Martin strand—rated at 6950 lbs.

by using
PLP GUY-GRIPS



Strand is terminated here
(no looping required)

1. Since PLP Guy-Grips eliminate looping, strand saving of 12 feet or more per guy results. SAVING: $.67 per guy

2. Substitute ¼" Extra High Strength Strand—rated 6650 lbs. PLP Guy-Grips make this possible since they hold the full rated strength of E.H.S. Strand. The following strand savings result (current cost of ⅛" galvanized strand is $2.24 per guy while ¼" E.H.S. costs $1.36 per guy)*: SAVING: $.88 per guy

TOTAL STRAND SAVING ALONE: $1.55 per guy

3. Preformed Guy-Grips cost only $.55 each for ¼" E.H.S Strand size. (PLP Cat. No. 25 GDE-¼")

Compare this cost with your current fitting.

In every Preformed Guy-Grip installation, you hold the full strength of the strand.

PLUS LABOR SAVINGS

☑ CHECK THESE ADDITIONAL SAVINGS:

- ✓ With PLP Guy-Grips, leading utilities estimate installation savings upward of 50%.
- ✓ Save an additional 10% by using 3-wire strand instead of 7-wire. PLP Guy-Grips will hold 3-wire strand equally well.
- ✓ Save space and inventory costs by standardizing on PLP Guy-Grips and lighter E.H.S. Strands. One size strand can be substituted for several sizes and grades previously used.

Let us give you more information on their exclusive advantages. Write or call Preformed Line Products Co.: Call EXpress 1-3571.

PLP GUY-GRIPS ARE ALSO AVAILABLE IN COPPER-WELD, BRONZE, AND STAINLESS STEEL.

*Based on current strand prices—75,000 feet to carload lots.

PLP GUY-GRIPS DON'T SLIP . . . even under impact!

PLP

PREFORMED LINE PRODUCTS CO.
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

(22) WHEN DAVID COCHRAN of Idaho Power Co.'s machine shop could not find a needed brace for a 15-kv hot-line jumper on the commercial market, he designed one, and has been steadily producing them for company use since. Braces for smaller sized cable have become available recently. Use of the brace would come under the heading of preventive maintenance, as illustrated by the worn cable. In a letter to Electrical West, Cochrane said there is still no commercial production of the brace

Current Transformers

(23) Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.

Better heat dissipation, increased dielectric strength and easier installation or replacement of this company's window-type current transformers are improvements reportedly gained by redesign of core, coils and insulation. The transformers are used in 600-, 4,160- and 13,800-v switchgear.

Wiring Device

(24) Pyramid Instrument Corp., Remcon Division, Lynbrook, L. I., N. Y.

This new low-voltage wiring device permits control of individual household outlets from any number of conveniently placed switches. The device has a built-in transformer which eliminates the need to wire each relay back to a central, external transformer. No. 18 bell wire replaces BX cable in the new system, because it only requires 6 v to activate outlets.

Use Coupon, Page 53, to secure manufacturer's literature on these products

LOW VOLTAGE SWITCHGEAR through 600 v a-c, 250 v d-c, 15,000 through 150,000 amp interrupting, 6000 amp continuous.

UNIT SUBSTATIONS—primary and secondary, indoor and outdoor construction—in all standard ratings, dry, askarel or oil transformers.

ISOLATED PHASE BUS through 138 kv and 10,000 amp.

METAL-CLAD SWITCHGEAR in ratings from 2400 v through 15 kv, 50 through 500 mva interrupting and 2000 amp continuous.

INDIVIDUAL BREAKERS, a-c and d-c, 15,000 through 150,000 amp interrupting, 6000 amp continuous.

NONSEGREGATED PHASE BUS through 15 kv and 6000 amp.

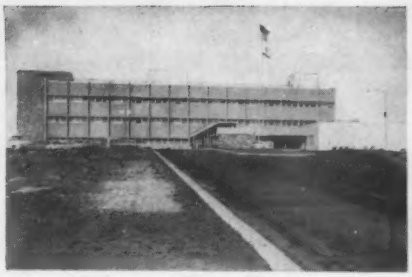
Economical: an I-T-E Power Package

An I-T-E Power Package includes the complete power handling facilities for a new construction project, building addition, or expansion of electrical service—one unit or a complete system for every application from generation to end use. You save in sound planning, easier installation, coordinated delivery, and assured performance—a better investment in every way.

For more information, contact the I-T-E sales office nearest you or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

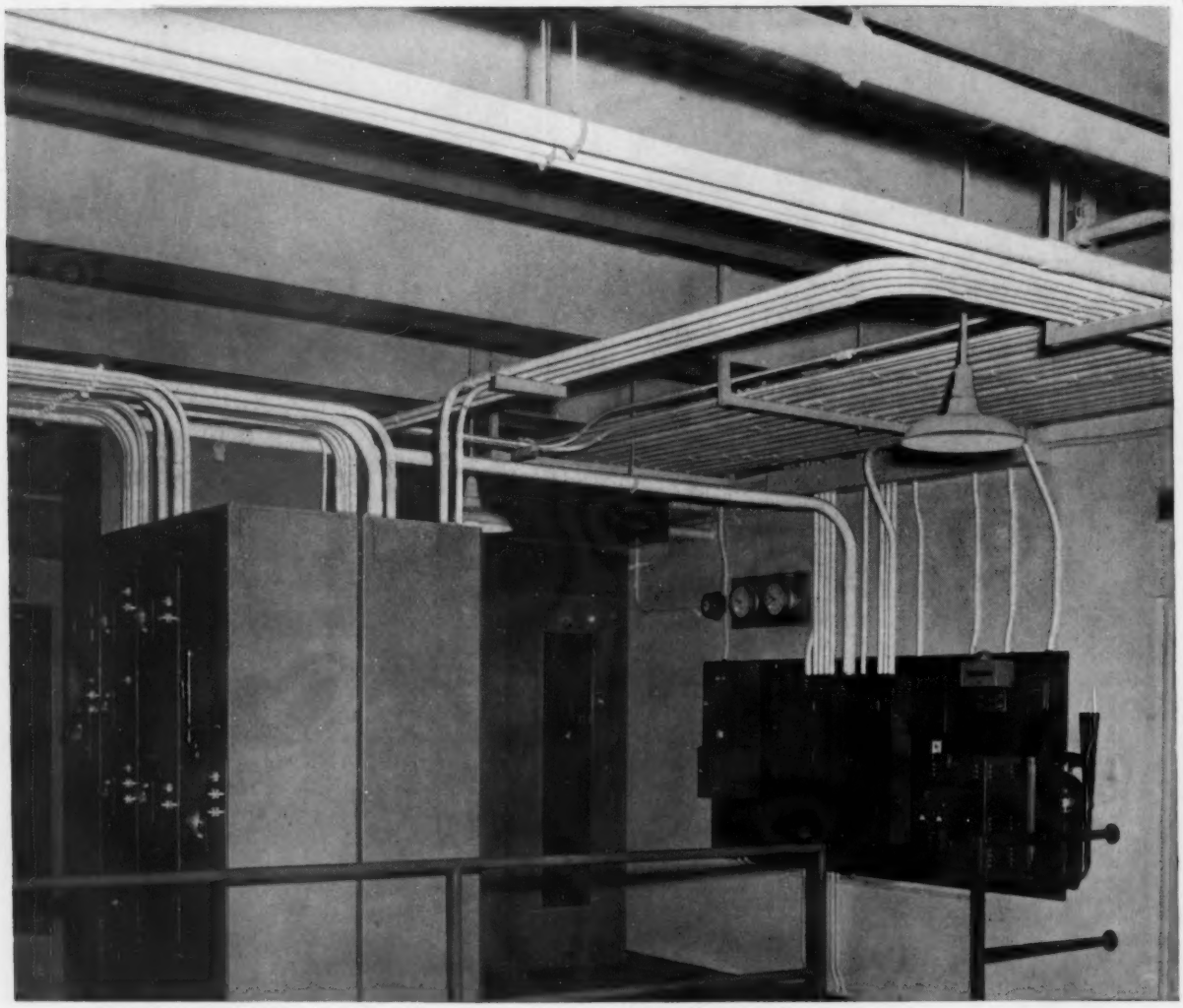
I-T-E



Mercy is the mission of the new Grossmont Hospital in San Diego's La Mesa area. Rome • RIGID provides lasting and safe protection for wiring throughout the entire building.

Merchandising is the mission of the Marston Company's new wing in San Diego. Capitol Electric Company specified Rome • RIGID for this important installation.

Two more for Capitol



A section of the Marston Company installation. You can get Rome • RIGID heavy-wall conduit in sizes from ½" to 6". with immediate shipment from Torrance, California.

The Story of Rome • RIGID, 8 pages of profitable reading for everyone in the electrical construction industry. Write today for your *free* copy.

important installations

Electric Company and Rome•RIGID conduit

Just as Capitol Electric Company does, you can build business by selling quality installations with Rome•RIGID steel conduit.

Case histories in point are the new wing of the Marston Company store and the new Grossmont Hospital, both San Diego, and both with Rome•RIGID conduit.

When you base your bid on Rome•RIGID you can figure on lower installation costs and a minimum of trouble. We assure you of this in the way we make Rome•RIGID.

Like no other

No other conduit can compare with Rome•RIGID because there's no other made *quite* like it.

We make it from hot-rolled sheet steel, shot-blasted on both sides to remove all oxides, dirt, rust and roughness. Then it's cold formed, thus retaining its strength and wall uniformity.

As the pipe is formed we make an electrical resistance weld which provides a superior joint, uniform pipe diameter, and surface quality. Of course, we painstakingly scarf away inside and outside weld flash.

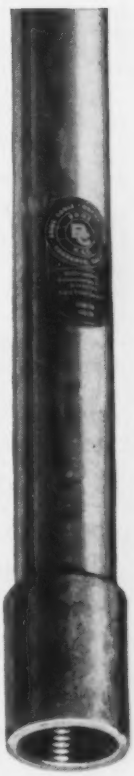
Hot-dip galvanized

Then, to give you conduit with a bright, tightly bonded, ductile zinc-coated surface, we employ the Sendzimir hot-dip galvanizing process.

The result of this automatically controlled process is a conduit with high uniformity of handling characteristics and quality on the job.

And it goes almost without saying that Rome•RIGID is smooth and easy to fish. You practically whisk cable through its low-friction, smooth interior—another saving of time and labor.

See your electrical distributor today. On your next conduit job, specify Rome•RIGID.



It Costs Less to Buy the Best

ROME CABLE Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA

WESTERN SALES OFFICES AND WAREHOUSES

SALT LAKE CITY 1, UTAH
230 South 4th West St.

LOS ANGELES 22, CALIF.
2510 South Malt Avenue

SAN FRANCISCO 24, CALIF.
1100 Selby Street

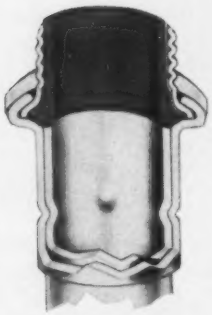
SEATTLE 4, WASH.
3430 Fourth Ave., So.

DENVER 3, COLO.
1160 Elati St.

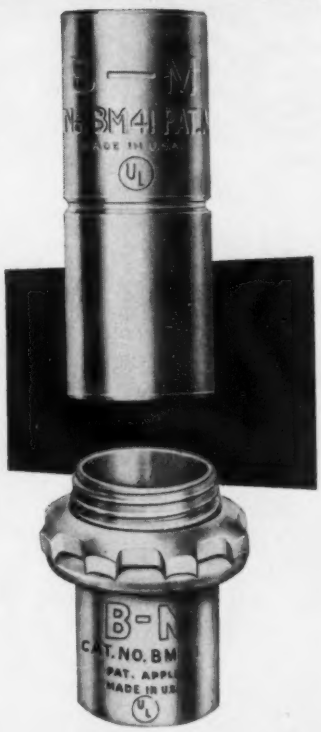
PORTLAND 5, ORE.
1020 S.W. Taylor St.

B-M INDENTER TYPE FITTINGS FOR E.M.T. Concrete-tight

Red Throat
Insulated
Connector



Red Throat
Cross section



Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job.

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

UL

TELESCOPE BM SYSTEM

BRIEGEL METHOD TOOL CO.

GALVA • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

SALES AGENTS FOR THE ELEVEN WESTERN STATES

Ernst Hauch
1282 Folsom Street
San Francisco 3, California

Ruthin Electrical Sales Co.
935 Stanford Avenue
Los Angeles 21, California

L. D. Hood Sales
1133 West 8th Avenue
Denver, Colorado

W. Wi Wheat & Son
2219—4th Avenue
Seattle 1, Washington

B-M COMPRESSION TYPE FITTINGS FOR E.M.T. Rain-tight

SIZES FROM ½" to 2"

SIZES FROM ½" to 2"

SIZES ½" ¾" 1"

SIZES ½" ¾" 1" 1¼"

SIZE ½"

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

BULLETINS ETC.

(25) PLUG-IN BUSWAY SYSTEM—A factory-assembled plug-in busway system permitting direct connection to bus bars for feeding lighting and power loads in industrial plants, schools, offices, commercial and public buildings is described in GEA-6470 published by General Electric Co. Copies available from Advertising & Sales Promotion, Distribution Assemblies Department, General Electric Co., Plainville, Conn.

(26) OIL FUSE CUTOUTS—Oil fuse cutouts in three voltage ratings and with interchangeable entrance fittings for lead-covered or neoprene-jacketed cables are fully described in CB56 of G&W Electric Specialty Co., 7780 Dante Ave., Chicago 19, Ill.

(27) TESTING INSTRUMENTS—A fully illustrated catalog of test and measurement instruments of James G. Biddle Co. is now available. Address is 1316 Arch St., Philadelphia 7, Pa.

(28) AIR CONDITIONING TIME CONTROLS — Tork Clock Co. Inc., Mount Vernon, N. Y., has published a data sheet to help with selection of the proper controls for air conditioning units.

(29) LIGHTING EQUIPMENT CATALOG — All items in the Steber line of lighting equipment are illustrated and described in a new catalog and contractor-dealer price sheet. Ask for CTC-1. Address is Broadview, Ill.

(30) LOW-VOLTAGE DISTRIBUTION — The new 1956-57 catalog of low-voltage electrical distribution equipment and components of General Electric's Trumbull Components Department is now available. Deals with equipment up to 600 v. Write to Assemblies & Components Sales, General Electric Co., 87 Whiting St., Plainville, Conn. Ask for GEC-1032A.

(31) DISTRIBUTION REGULATORS — The exclusive unit construction of Allis-Chalmers 5/8% step voltage regulators is described in this 16-page booklet. Includes features that assure easy installation and improved operation and maintenance. Copies of 21B7977A may be secured by writing Allis-Chalmers Mfg. Co., 939 S. 70th St., Milwaukee, Wis.

(32) SAFETY POSTER — A colorful poster card showing the proper care and handling of linemen's rubber gloves is available from Charleston Rubber Co., Stark Industrial Park, Charleston, S. C. Text and illustrations are completely devoted to the subject, not to advertising. Size is 18x22 in.; colors are yellow, black and white to stand out in locker rooms, lunch rooms, etc.

(33) CABLE ACCESSORIES — Five new publications devoted to cable accessories of G&W Electric Specialty Co., 7780 Dante Ave., Chicago 19, Ill., are available now. They are: CB56, oil fuse cutouts; JA56, splicing kits; BB55, cable boxes; discount sheet 56 and G&W Forethought.

(34) MANUAL AERIAL LADDER — J. H. Holan Corp., 4105 W. 150th St., Cleveland 11, Ohio, has published a brochure devoted to its manually operated hydraulic ladder, Series 2500.

(35) DISCONNECTING SWITCHES — Details about the complete line of B-2K single-pole, outdoor, hook-operated disconnect switches are contained in a publication of Delta-Star Electric Division, H. K. Porter Co. Inc. Fully illustrated. Write to 300 Park Ave., New York 22, N. Y.

KILL TWO BIRDS WITH ONE STONE — Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after July 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	

If described in advertising, fill in page number

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

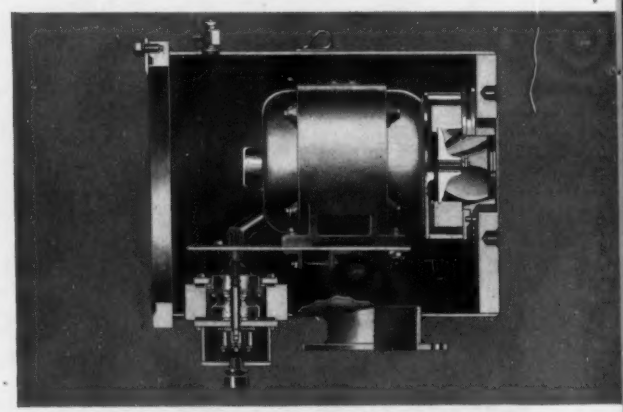
OPTIMUM INVESTMENT*
Power Transformers

IMPORTANT MILESTONE of 25,000,000 KVA of FOA capacity shipped by G.E. was reached earlier this year. Increased purchases mean next 25 million KVA should be built by 1961. Unit was shipped upright for easy installation with all accessories on the same flatcar.

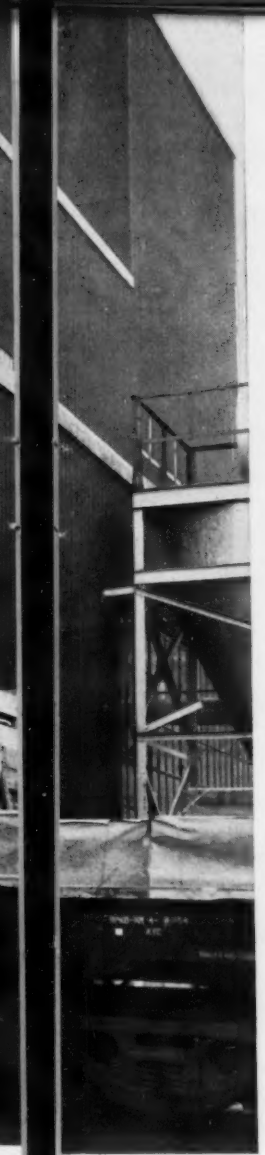
*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your large power transformer investment, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements and few failures reduce outages.



EXCEPTIONALLY RELIABLE PUMP MOTOR is key to acceptance of FOA units—fewer than ten have ever been removed from service for any reason. Pump can be mounted in the ideal hydraulic position above unit coolers.



Utilities save $14,000,000 in 19 years by using G-E FOA power transformers

Milestone of over 25,000,000 KVA of forced-oil-air cooled capacity in service typifies big, first-cost savings available to utilities.

Large capital savings may be possible when you purchase a power transformer. Consider cooling methods. Earlier this year, the power transformer containing General Electric's 25 millionth KVA of FOA (forced-oil-air cooled) capacity was shipped. Compared to the price of more costly units which would have been built with other types of cooling, utilities saved over $14,000,000 in capital expense.

Such first-cost savings are available to power transformer users who choose FOA cooling. In other areas too, such as reduced BIL (basic impulse insulation level), three- or single-phase, and auto- versus conventional transformers, significant capital savings may be possible for a specific application. These savings are made possible by continual product improvements.

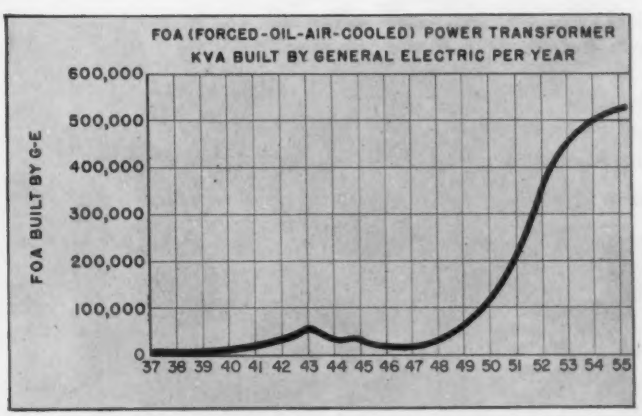
IMPORTANT FEATURES of FOA cooling are the directed-flow concept, the reliability of the oil pump, and the ability to operate for a specified period without auxiliary power. The directed-flow design, introduced by G.E. in 1937, coordinates the amount, velocity, and paths of pump-driven cooling oil. This cost reduction is made possible, basically, by substituting low-cost electrical energy (to operate pump motors) for the high-cost extra copper and steel that would be required by self-cooled designs.

OIL PUMP RELIABILITY, which permits the G-E pump to be located in the optimum hydraulic position on top of the unit cooler—giving a positive oil pressure inside the heat exchanger—is proved by the fact that fewer than 10 pumps, out of the nearly 2000 in service, have ever required removal for any reason. At least one hour's operation at full load, without auxiliary power, depending on previous loading, permits the application of FOA units even in unattended substations.

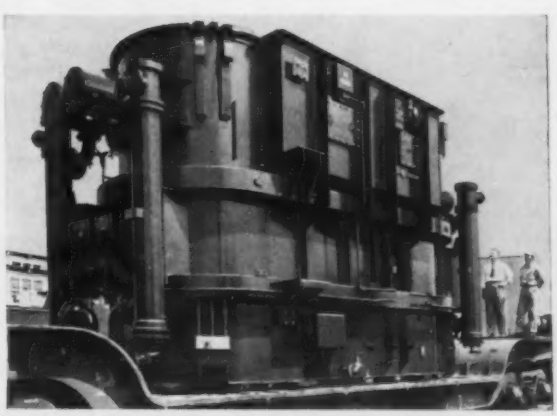
These are examples of features designed to give you a low purchase price. There are more. And, combined with other features that give low operating, installation, maintenance and engineering costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Company, Schenectady 5, New York. 421-40

Progress Is Our Most Important Product

GENERAL ELECTRIC



TREND TO FOA shows accelerating utility acceptance. Economy and reliability have led to fact that 65% of large power transformer KVA, currently being shipped by G.E., is FOA.



FOW (forced-oil-water cooled) power transformers offer additional economies where adequate water is available for cooling transformers. Shown is 275 MVA unit.

WHEN A GIANT DECIDES... BIG THINGS HAPPEN!

GLOBE, one of America's largest manufacturers of lighting fixtures, forges ahead to its rightful place at the top!

You've no doubt been hearing that momentous things are happening at Globe — And the rumors are right!

Here is what Globe has done during the past ninety days...

- **INTRODUCED** the most comprehensive newsmaking line in home lighting history
- **PUBLISHED** a full-color "portable showroom" catalog of the salable new Globe line
- **OPENED** its newly redesigned Manhattan showrooms, the most beautiful in the industry
- **HELD** lighting shows for hundreds of architects and decorators
- **LAUNCHED** a titanic advertising campaign aimed at all trade segments—jobbers, contractors, builders, architects, decorators, utilities, etc.
- **BEGAN** its mass media advertising schedule that will reach over 12 million consumer readers of such magazines as House Beautiful, House & Garden, Living for Young Homemakers, etc.
- **SET** the market buzzing with Globe fixtures featured on network television and in national magazines... and publicity tie-ins with Globe-inspired hats by the famous Mr. John
- **INCREASED** its national sales force by 40% coast to coast with greatly expanded warehouse facilities just completed to meet increasing demands

IT'S EASIER TO SELL GLOBE—THAN SELL AGAINST IT!

GLOBE

LIGHTING PRODUCTS, INC.

Write today for your copy of the new 44-page full color Globe catalog.

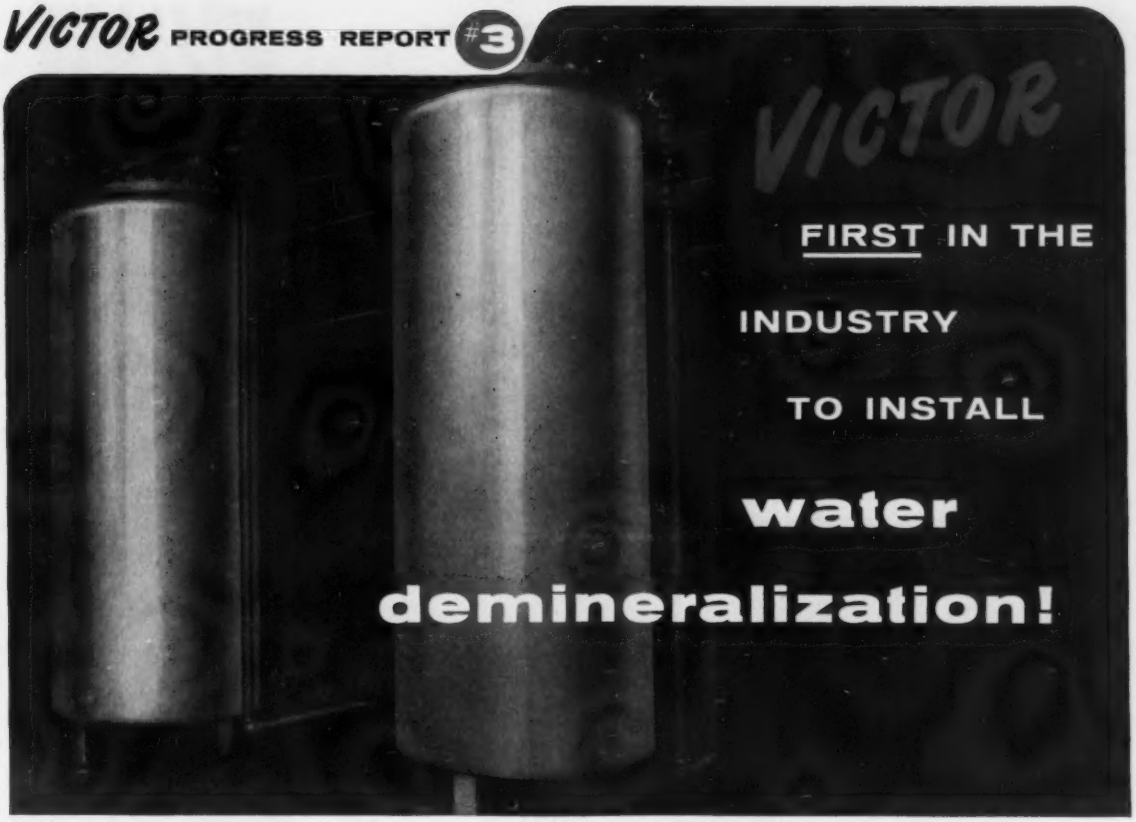
See the complete GLOBE line at our New York Showroom: 16 East Fortieth St.

1710 Flushing Ave., Brooklyn 37, New York

"Leaders in lighting for over a third of a century"

San Francisco 1, Calif.
P. O. Box 1122

VICTOR PROGRESS REPORT #3



Victor's extensive ceramic research first brought to light the fact that minerals in processing water cause microscopic agglomerates of glass-like impurities which result in fluctuations in insulator characteristics. As a result, Victor was the *first* porcelain insulator manufacturer to install water demineralization equipment, part of which is shown above. For several years, *all* processing water used in Victor's plant has been demineralized.

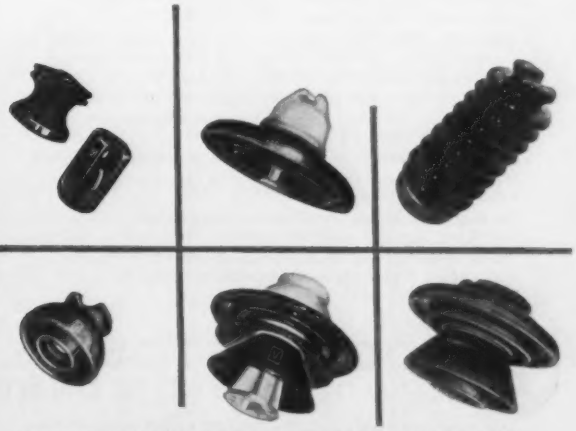
Exhaustive tests have proved that Victor *Purified* Porcelain Insulators, made with demineralized water, have: (1) improved thermal resistance; (2) unmatched porcelain hardness and density; (3) higher average puncture values, and (4) better tension, torsion, cantilever and impact values.

Another example of Victor's ability to give you better insulators through research and modern manufacturing facilities.

SPECIFY VICTOR
Purified Porcelain
Insulators!

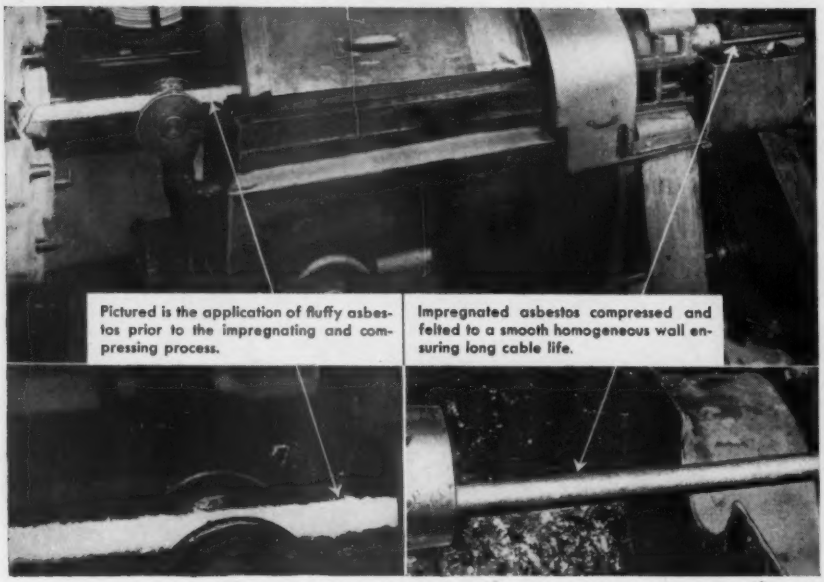
VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware



"BETTER INSULATORS THROUGH RESEARCH"

seamless FELTED ASBESTOS walls add up to long range economical service



Pictured is the application of fluffy asbestos prior to the impregnating and compressing process.

Impregnated asbestos compressed and felted to a smooth homogeneous wall ensuring long cable life.

look beneath the braid

. . . *that's where quality begins*

Long lasting, trouble-free circuit performance depends on the materials and construction of wire and cables. And a look under the braid shows why Rockbestos A.V.C. (N.E.C. Type AVA) is built to give longer service.

The two seamless, dense felted asbestos walls, compressed and thoroughly impregnated with selected compounds, seal the varnished cambric from heat and moisture.

Dielectric strength stays high under high ambient temperatures. Heat dissipation is uniform. The felted wall construction protects the varnished cambric from rupture in the sharpest bends.

HERE'S HOW YOU BENEFIT*

Get high dielectric values from Varnished Cambric because of its controlled application over seamless felted asbestos walls.

HIGH DIELECTRIC STRENGTH — minimum breakdown voltages for 600 and 1000 volt power cables — 15 KV.

MOISTURE RESISTANCE — same minimum dielectric breakdown — wet or dry — 15 KV on 600 and 1000 volt power cables.

RUGGED CONSTRUCTION — minimum breakdowns after bending tests — 15 KV for 600 and 1000 volt power cables all sizes.

CONTROLLED QUALITY — materials and workmanship and performance under rigid Quality Control.

CUTS MAINTENANCE COSTS — It won't bake brittle, crack or flow in high ambients . . . won't deteriorate with age, or rot when exposed to oil, grease or fumes.

The result: wire failures are eliminated; maintenance costs are held down; plant and equipment operation maintained at top level.

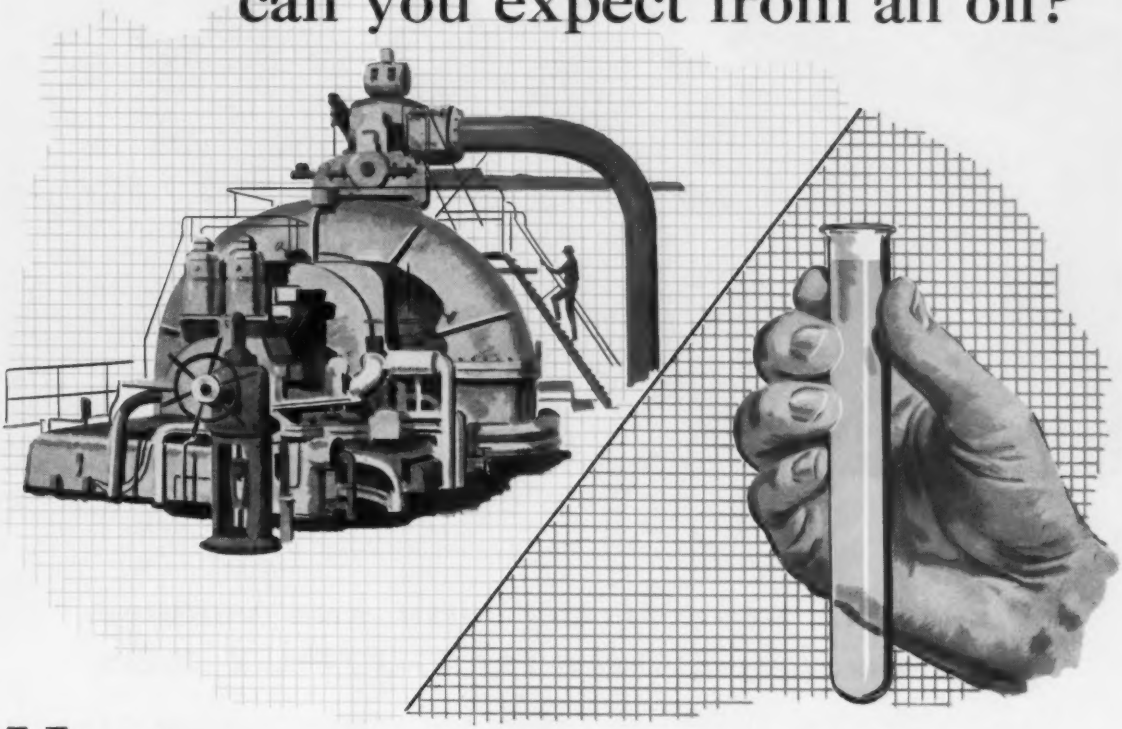
*Write for the test and construction specifications of Rockbestos A.V.C. (N.E.C. Type AVA) available in the new booklet, "Specification RSS-88."

STOCKED COAST TO COAST
Standard Rockbestos A.V.C. construction (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

ROCKBESTOS PRODUCTS CORP.
NEW HAVEN 4, CONNECTICUT

NEW YORK CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA

How much turbine "insurance" can you expect from an oil?



Here's an encouraging answer from Shell men, techniques—and experience:

Research men started at the heart of the problem: Rust and oxidation of oil, they found, were the major causes of turbine troubles.

So they set out to develop an oil with special rust and oxidation fighting qualities. The result of their research is SHELL TURBO OIL—an oil which continues to stop these turbine hazards *long after* ordinary oils fail.

So effective is Shell Turbo, that charges have been in use in several large installations since 1940—with little change in properties and no sign of turbine trouble due to rust or sludge deposits.

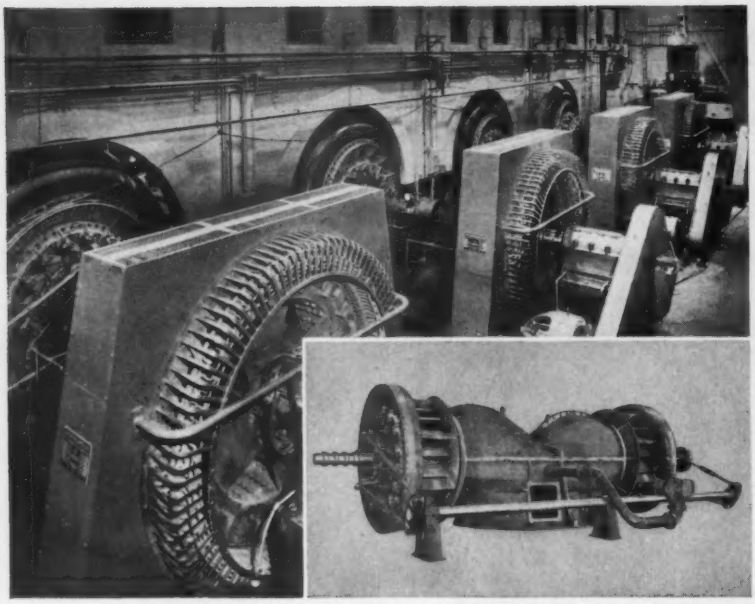
This kind of turbine "insurance" is to be expected because Shell Turbo contains some of the *most effective inhibitors known.*

This Shell oil is just one of the many fine products developed by Shell's 1500-man research team—a team with 25 years' experience in lubrication problems.

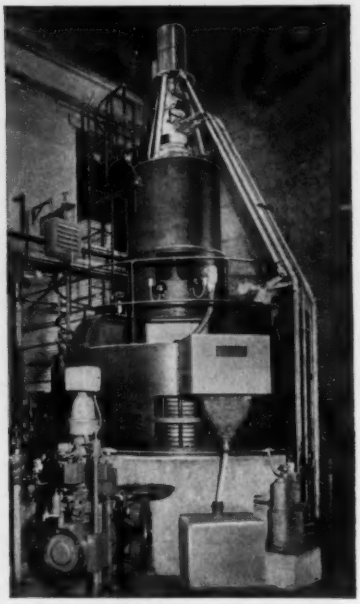
A telephone call can put this team to work solving your lubrication problems. Call in your Shell representative today.

SHELL

SHELL TURBO OIL



Horizontal generating units are each driven by a pair of modernized SMS-Francis turbines shown (inset) during shop assembly.



At remote end of the power house, a vertical SMS-Kaplan unit, mounted in a concrete pressure flume provides flexibility of operation.

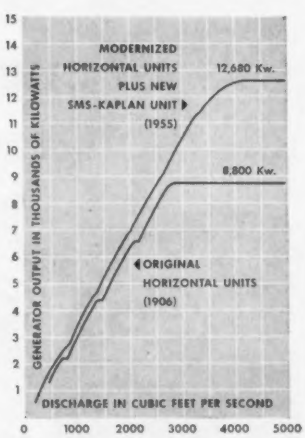
Consulting Engineers: Pioneer Service and Engineering Co., Chicago, Ill.

MINNESOTA HYDRO-PLANT WITH SMS TURBINE MODERNIZATION BOOSTS OUTPUT 35%

By completely modernizing a half-century-old horizontal turbine installation having the inside type of gate mechanism, the Upper Midwest's largest utility has raised the potential KWH output over 35%. This resulted from increased plant efficiency and greater installed capacity. The rebuilding program was a result of careful engineering studies made over several years by SMS in cooperation with the utility and their consultants with whom the purchase of modernized horizontal turbines was finally negotiated.

Four pair of horizontal SMS-Francis wheels with motor operated outside gate mechanisms were mounted on new 9-foot draft chests in the existing 14-foot diameter top supply pressure cases. An additional SMS-Kaplan turbine, rated at 3,500 HP under the 48-foot head, was added to provide flexibility and take load variations at a high efficiency over a wide operating range.

Whether your interest is modernization or a new station, you can rely on the broad engineering background of 80 years' experience available to you at SMS. For information on hydraulic turbines and accessories, write S. Morgan Smith Co., York, Penna.



Performance of modernized units based on index tests run in January 1956. Performance of original units based on guarantees when new.

S. MORGAN SMITH

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

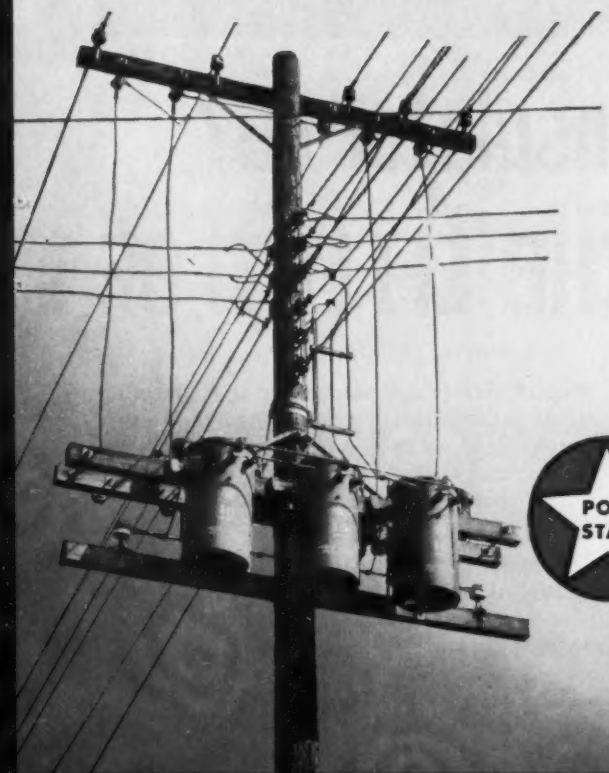
HYDRAULIC TURBINES
GATES & HOISTS
TRASH RAKES
PUMPS
ACCESSORIES
HYDRODYNAMICS
ROTOVALVES
FREE DISCHARGE VALVES
BALL VALVES
CONTROLLABLE-PITCH SHIP PROPELLERS
BUTTERFLY VALVES

you don't have to tip that crate ...it's a "Pole Star"

As a matter of fact, the truck operator doesn't even *need* a helper to handle Pennsylvania Pole Star transformers from 3 through 100 Kva, 15 Kv and below. That's because they're all furnished with wrap-around, wire-bound crates equipped with *bottom skids* . . . a practice long followed by Pennsylvania Transformer Company for units 37½ through 100 Kva and now extended to all smaller Kva sizes.

This newest Pole Star "extra" means easier handling at every stage: when unloading incoming trucks . . . when arranging stocks in the warehouse or pole yard . . . when loading for transportation to the field. The crates are designed for handling by one man with a standard warehouse-type fork lift truck. Transformers may be stacked vertically, too, for conservation of space.

Customer advantages like the new Pole Star crate illustrate Pennsylvania Transformer Company's never-ending concern with *all details* of transformer use . . . from ease-of-handling to efficiency-of-operation. We invite you to write, wire or 'phone for more details.



POLE STAR

Distribution Sales Department

Pennsylvania Transformer Company

A McGraw Electric Company Division

CANONSBURG · PENNSYLVANIA

Pole Star transformers are available in sizes 3 Kva through 500 Kva and in voltages from 480 through 67,000 volts.

CAREFUL INSPECTION of shells immediately after forming is only one of 77 control procedures and tests involved in the production of MICRO-GLAZE® Suspension Insulators — your assurance of dependable service.

How good can an insulator be?

CONSIDER THE EFFECT OF

The dependability of insulators — whether suspension, apparatus, pin type or other — is related directly to the *accuracy* with which each insulator shell is molded from extruded clay.

Ultimate values of flashover, dielectric strength and mechanical strength depend on exact configuration. Even slight variation in any dimension, might reduce the high degree of safety built into each unit. To be certain the dimensions of your insulators conform to engineering specifications, Locke not only inspects each formed shell visually, but also spot-checks internal dimensions on a routine basis. Any variation from standard shell contour is cause for rejection.

The case of Shell Formation "Quality Control" is typical of the extremes to which Locke goes to assure trouble-free insulator service on your system.

For a brief and complete picture story of insulator quality control, just call your Locke representative.

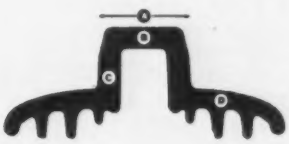
PERMANENT BONDING of caps and ball bolts to the finished suspension insulator shell is possible only with a good fit. Here the head sliced from a typical shell is carefully checked for proper diameter (A—outline below).

RESISTANCE TO PUNCTURE of the finished suspension insulator depends largely on the thickness of porcelain separating cap and ball bolt. This head thickness (B) is subject to constant inspection.

OVERALL STRENGTH is assured by constant checking on wall thickness (C) across two diameters. By making sure that these measurements are equal, eccentric forming and possible structural weakness are avoided.

MAXIMUM FLASHOVER STRENGTH and full leakage distance are maintained by rigid control of corrugation size (D). Frequent spot-checks assure proper forming.

SHELL DIMENSION



LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Performance Protected by

77 POINT
QUALITY CONTROL

*Trademark of General Electric Company

ELECTRA'S HUSBAND

"We Just Buy"

"What do you think about buying something on time?" asked Electra, looking up from one of the shelter magazines that she reads so religiously.

"That depends on what's being bought and who's buying it," I said cautiously. "What's on your mind?"

"Oh, there are some things that I wanted to do around the house and I'll just never be able to save up enough to pay for them outright on the allowance you give me."

"Come now, I increased your allowance only last month," I pointed out reasonably. "And the increase should cover the payments on a pretty good sized renovation program."

"Maybe it would," admitted Electra grudgingly, "but I hate to go into debt and besides I read somewhere just recently that all this credit buying is going to plunge the country into a depression."

This, I recognized, was Electra's "oblique approach" to a problem. She had already made up her mind to go ahead with her projects but was cuing me in (a) to reassure her that it was o.k. and (b) to ensnare me to a point where the decision would be partly mine. It's standard bail-out procedure. Most wives have it—in some form.

"Oh, there's nothing wrong with credit buying—in fact, it's a mighty good thing. It's the oil that makes the wheels of business turn smoothly. It was the use of credit by the Italian merchant princes that really started to bring Europe out of the Dark Ages. Ever since then short-term borrowing has been an extremely useful tool in manufacturing goods and getting them to market."

"That may be all right for businessmen but what about us housewives? We don't buy and sell things, we just buy."

"And it's a very good thing that you do," I said. "The whole philosophy of the American economy is to get consumers to buy more and more of the good things of life. Our whole standard of living is based on the simple fact that we have made it easy to buy both the necessities and luxuries of life. Historians are going to look back on 20th century America and point out that its two greatest contributions to the health and comfort of the masses were its development of productive techniques and the extension of credit use from the commercial to the consumer area."

"You make it sound good," said Electra, "but you aren't going to have to meet the payments."

"Oh stop trying to be a martyr, Electra. You know very well that you can buy almost anything your little heart desires, and pay for it too—over a period of time. In fact, the discipline of having to meet a monthly payment might be good for you."

"I don't need discipline," flared Electra, "and besides it would be better discipline if I just put a little away each month and waited until I had enough saved up to pay cash for what I want."

"You know that won't work," I stated, "the minute you got a little cash ahead you'd blow it on a new hat or decide we needed a short vacation together. If American Business had to wait for all the housewives to break open their piggy banks to buy its wares, the whole country would still be in the kerosene-lamp era. The pay-as-you-use principle is the only way possible that everybody could have automobiles, television sets, automatic appliances and all the other things that you housewives rate as indispensable today. It's the one thing that makes our high standard of living possible and the one thing that distinguishes the U. S. from all the other countries of the world. You ought to live in some other country for awhile, where you couldn't get credit even if you wanted to."

"If it's so good over here then why don't these other countries adopt the system?" asked Electra logically.

"Well, in the first place," I explained, "most of them aren't quite as happily situated as we are here. Take Great Britain, for example. She doesn't have the natural resources or the productivity that we have. A large portion of her manufactured goods has to be exported in order to enable the British people to get the essentials of life such as food and other things. If the government permitted unrestricted use of installment credit in Great Britain most of her products would go into the home consumption market. The English housewife wants the good things of life just as much as you do but she can't have them because the costs of installment buying are practically prohibitive—by government decree. You would scream like a panther if you had to pay the interest rate on a household loan over there."

"O.k.," said Electra, "that takes care of England. But how about some place that has lots of natural resources—like Soviet Russia, for example, or Brazil?"

"They are in two entirely different categories. Brazil and a lot of other countries do have many undeveloped natural resources but they don't have a productive machine and nobody but the Americans have figured out how either to build a productive machine without a market or to supply a market without a productive machine. They have to grow together and it takes a lot of business ingenuity and intestinal fortitude to maintain a balance that will keep both of them growing at approximately the same rate. It's not possible to do it at all without a good base of consumer credit.

"As far as Russia is concerned, she is putting her productive machinery to work mostly on armaments and heavy industry. Russian leaders have no intention of making it possible for their people to share in the productive capacity of the country yet. In fact, their fondest hope is that the credit structure of this country will break down and cause a major depression. Then they figure they would have a better chance of taking over."

"It seems to me that something like that just could happen," said Electra. "There's been a lot in the paper lately about the billions and billions of dollars that are owed for automobiles, appliances, homes and other things. If it's as easy to buy things as you say it is, it seems to me that a lot of people could be easily persuaded to overextend themselves."

"There is a lot of outstanding credit," I agreed, "but the ratio of credit to the total consumer income is lower today than it was in 1929 when the big crash occurred. Today we've got a lot more and better ways not only of measuring the effect of credit on the over-all economy but we've also got better tools with which to control its use. Don't worry too much about it."

"I guess I'll go ahead," decided Electra, "I'll make both ends meet somehow. How would you like beans for supper?"

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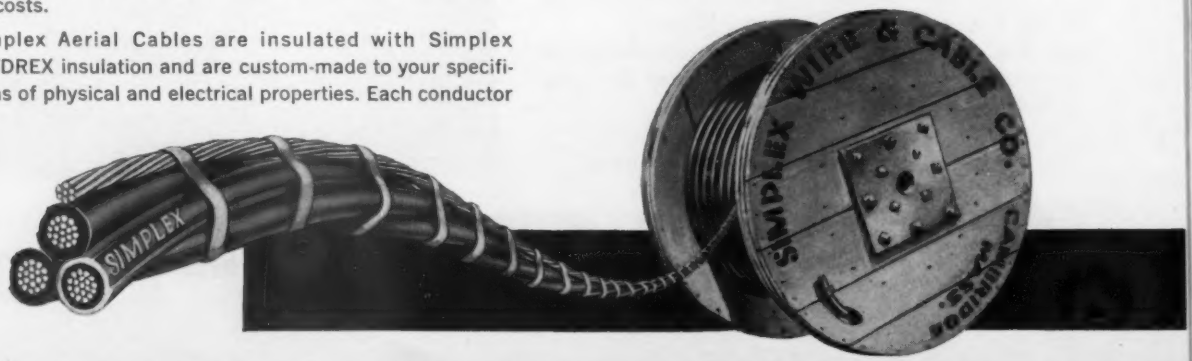

ELECTRICAL WEST

Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

In full bloom

Like spring, conventions were bursting out all over last month—and more are in bud for May. Those who used their eyes and ears could have taken home lots from them. Both from the program and bull sessions, they reflect the progress of the industry and point trends for guidance in the future.

Your proxy

For those who could not attend—it is also the busiest time of the year—digests of each meeting will be given in our June "Convention" issue. Meanwhile, significant highlights are pointers to what is to come. Give heed!

Suspension

A motor without iron laminations was a surprise at the Electrical Industry Show of EMEA in Los Angeles. Iron filings cast in Epoxylite resin made a satisfactory magnetic field for the stator and the motor actually ran. Undoubtedly, this will lead research in a new direction for motor improvement.

Frightening prospect

"Every two minutes there is one more person in metropolitan Los Angeles," kick-off luncheon speaker Edmund McKanna warned. He outlined the problems as well as the opportunities such a prospect imposes and urged men in industry to participate in solving the regional problems such growth imposes.

Light turns homeward

If street and highway lighting featured the conferences of Illuminating Engineering Society at Los Angeles last year, residential lighting had star billing at the San Francisco South Pacific Coast regional conference. Walter Doty, Sunset Magazine's research editor, added to his own perception of the problem the views of Architect Robert Anshen and Landscape Architect Lawrence Halprin. Then E. W. Commery, G-E Lamp Division's top expert on home lighting, climaxed by exciting the imagination with a luminous environment test room. Fixture men may not like the obvious trend toward building in luminous walls and ceilings that might well catch on with the public as the ideal way to light a home.

The trend

Luminous ceilings and walls crept into all sessions except the street lighting one. Even an industrial plant with 175 f-c was described by Thomas Allinson of Beckman Instruments Co., Richmond.

School views

School lighting problems occupied a major part of one session in the Intermountain regional conference, IES, Salt Lake City, April 26-27 (no school lighting was on the San Francisco program). Fred M. Fowler, Utah State School Plant Planner, and Leon Miller, Salt Lake City School Superintendent of Buildings, presented school men's views; J. R. Williams, Arizona Public Service, reported on daylight measurements in that state's schools where the sun is brightest.

Brightness fight

An impasse that may affect acceptance of IES revised school lighting standards in California brought to a close the meeting in Los Angeles early in April of the IES school lighting committee, the AIA National Committee of School Design and the National Council on Schoolhouse Construction. Western participants could not accept 1,100 f-l brightness even for 'small areas.' They maintain that goals should not be sacrificed to rationalize fixture design.

What's wrong in picture?

Don't wire built-in range components the way it is diagrammed on the front cover of the News-Bulletin of International Association of Electrical Inspectors. Charles L. Smith told this to each of five IAEI meetings in the West that he attended in April. The idea was, said Smith, to awaken inspector readers into reading the article by B. A. McDonald inside, where they would learn it was not kosher. The subject has been one of much argument at all inspector meetings as the built-in appliance trend moved upward.

Misleading ads, even from three prominent national makers of appliances, tell the unsuspecting public they can plug in dryers to any circuit, inspectors at three meetings complained. In one chapter, a resolution to IAEI will be taken to NEMA and the American Home Laundry Assn., urging honest advertising. Inspectors have been called in by the public when the appliances failed to perform and were irate when told they would have to rewire. **Hot promises**

Copper, after its raise to record level last month, settled back a couple of cents a pound and some wire manufacturers retreated with it. Foreign demand likewise softened so there was hope wire prices would stay put for a while. Aluminum Co. of America raised the aluminum price 1½c a pound late in March, too. Steel prices have inched up, possibly in anticipation of wage increases, now under negotiations. Inventories of steel have been built up, possibly anticipating a steel strike, and the industry is producing at full capacity. **Is it through?**

No action on S-1644, the federal construction contract act, had been reported as this went to press. The Refrigeration & Air Conditioning Contractors Assn. has joined forces with NECA in urging passage of the act. **Last ditch**

Promise of better attendance even than at the San Francisco conference last year was given by the advance registrations for the NECA District 6 and 8 meeting in Salt Lake City, May 3-5. Only California seemed meager in its representation. **Success forecast**

Highest performance for 1955 for any district was won by the Northwest District of the Construction Materials Division, G-E Co. Consequently it was rewarded with a sales meeting at Sun Valley April 11-13, at which representatives brought their wives. Attending from Bridgeport were Howard W. Black, general manager; R. C. Dean, manager of field sales operations; Ray Elmandorff, conduit products marketing manager; R. D. Graham, manager contractor material sales from Providence. **Top men rewarded**

W. W. Bryan, who has been Northwest district manager of the Construction Materials Division, G-E, Seattle, recently was made manager of the Pacific district, with headquarters in Los Angeles, to succeed Daniel F. Flinn II, who went to American Factors Ltd., Honolulu. R. C. Scheay has been appointed the new Northwest district manager. **Fills the gap**

Fresno has now joined the area health and welfare plan set up for the San Francisco Bay area. Bakersfield and Stockton had previously joined the same program. **Wider area**

Turned down by President Gordon Freemen of IBEW was the clause in the Boise agreement requiring out-of-state contractors to consider Boise as headquarters for obtaining men. This followed the policy Freeman declared to all unions regarding travel and subsistence and manning of work in their jurisdictions. **He means it**

New ordinances are being obtained in Utah from the efforts of the legislative council of the Intermountain Electrical Assn. Floyd Shipp, NECA chapter manager, heads the active committee which reports, in addition to a new Salt Lake City ordinance, one for Davis County at Farmington and submission of new ordinances for Salt Lake County, the city of Ogden, Brigham City and Logan. Similar ordinances are being proposed in Pocatello and Idaho Falls and later, Twin Falls. All will have the 100-amp minimum service requirement. Meanwhile work is going on to re-submit the state law in Utah, according to Ernest Schettler, IEA president. **Inspection attrition**

Utah-Idaho Chapter of NECA moved its offices from the Zions Savings Bank building on April 1, to Room 207 at 260 E. First South, Salt Lake City. **Move**

A little late we report officers elected by San Diego County Chapter, NECA. A. C. Eddy, Ets-Hokin & Galvan, was installed as governor, a position he has previously held several times. President is Joseph M. Burkhart; vice president, Charles Bratton; treasurer, Robert Davies; secretary, Shelby Wiggins. Additional directors are H. L. Faucher, Norman Ferguson and Thomas Heinz. Al Berg, Los Angeles, president of the California-Nevada conference of NECA chapters, performed the installation. **Leaders named**

Checkered career

Component houses were a surprising yet logical prediction made recently by John C. Martin, head of Frigidaire's future product planning department, to the Prefabricated Home Manufacturers Institute. He pictured a house as one huge room with exterior and interior walls, finished with roof and ceiling. Inside this enclosure will be placed free-standing, completely integrated modular components, such as the kitchen, bathroom, utility room and bedrooms. With this "it will be possible for a builder to play checkers with these components and offer a wide variety of interior arrangements." What a deal for the wife who likes to move things around!

Fit it to the need

Changes to broaden FHA Title I loans are being asked of the Congress by the Council of Mechanical Specialty Contracting Industries. It asks that loan limits be raised from $2,500 to $5,000 and from $10,000 to $15,000 on multiple-family units, with terms up to 10 years. Also asked is that Title I be put on a permanent basis.

Living on tour

General Electric's Home Caravan has started a tour of the Western states. Housed in a 40-ft trailer truck, the caravan carries a staff of six people and showings are made in a series of cities from Texas through southern California, the Pacific Northwest and Mountain states. Meetings usually are arranged for the local industry and then the caravan displays are open to the public.

Growing signs

Oregon's state electrical inspection staff is being increased from its present 17 to add one or two more inspectors. The volume of new construction in that state has grown tremendously, requiring more staff. Reported on architects' boards are more than $100,000,000 in building projects this year. New shopping centers seem to dominate the construction picture. Portland alone has four under construction, as well as a new airport in the planning stages.

People you know

Some names in the news: John P. Lawton, Northwest district maanger for Graybar, was recently made a director of the company at the annual meeting of the board. He joined Graybar in 1923 as a student in the Chicago house. Later served as Des Moines manager, then Seattle, and since 1946 as district manager . . . Ben Wheater, formerly chief inspector for Long Beach, retired March 7, and Charles G. Metzger was appointed in his place . . . Ben E. Polley, former electrical inspector, Las Vegas, Nev., has been replaced by Emmett Markell . . . William Flynn, lighting engineer for Sacramento Municipal Utilities District, has taken a job with the State of California Architectural Division . . . John Cain, former Westinghouse Lamp, has joined C. T. Bakeman & Associates, Wakefield representatives, San Francisco . . . Robert B. Hyneman of Wesix, Seattle died recently . . . Sterling Gardner, owner of Gardner Electric Co., Los Angeles, died March 24 . . . E. S. Reichard had been appointed electrical engineer for General Petroleum Corp., Torrance, Calif. He had been head of the maintenance division for the company for some years . . . Robert Rosvall, formerly of Empire Broadcasting Co. in Englewood, Colo., has joined the Afton-Lemp Co. in Boise.

Indented trough

Flushduct is the name of a new underfloor wiring system to provide a raceway installed by trenching the existing floor. It is announced by National Electric Products. Linoleum or other surface materials are laid directly over the duct system.

Island hopping

The Island of Hawaii is next on the list for the starting of a division of IAEI Hawaii Chapter. A trip will be made there in June by John Thomas Carey, Hawaii Chapter chairman, and Francis M. McKinney, secretary-treasurer. A similar trip was made April 3 to Maui and a division formed there with Joseph Okimoto, chairman, Samuel Goo, vice-chairman, and Hirotoshi Matsuda, secretary. Okimoto is county inspector. The territory includes the Island of Maui, Lanai and Molokai. J. C. Vibas Jr., National Electric Supply, and Samuel Haae accompanied the party.

IES notes

San Diego will probably be selected for the regional conference of the South Pacific Region, IES, in 1958, Los Angeles for 1957. Carlton Thompson of San Diego Gas & Electric has been nominated for the regional vice-president, succeeding Prof. Dan Finch of University of California . . . All IES members have been asked to vote on an increase in dues of all classes of members.

Contractors Division of the Bureau of Home Appliances, San Diego, featured a cooperative home wiring, lighting and garden display 107 ft long at the Spring Fair, April 24-29. Every item in the electrical construction field was fitted into a pattern. "X-ray walls" allowed a view of the wiring. It was manned by electrical contractors and distributor salesmen. The display formed a center of the contractor building master exhibit. — **"X-ray" wiring**

Frank Short's Bulletins are not to be continued. Announcement was made following his death. — **Stilled**

Sacramento started a Certified Lighting program in April under auspices of the Sacramento Valley Electric League . . . San Diego's CL class, the second, was recently finished and a third started. Los Angeles' program with its first class has also been completed and preparations are being made for another course. An industry committee is developing a follow-up advertising program . . . Intermountain Electrical Assn. in Salt Lake City is contemplating a program soon. — **On the march**

A National Farm Wiring conference will be held in Chicago May 3 and 4, the first of its kind, sponsored by NEMA . . . May is also National Water Systems month with a program tied to that of Operation Home Improvement. — **May days**

A Homes Beautiful exposition was held at the San Jose civic auditorium April 12-15. Santa Clara-San Benito Chapter NECA and PG and E cooperated to present a Live Better . . . Electrically and Housepower program in the electrical display they sponsored jointly. — **In there pitching**

Southern California Edison now has 40 lighting men in the field covering its territory, according to Roy Dahlin, director of lighting. Five have been added in the past year. Additional people are working on residential lighting, which is also featured by the home economists. — **Light Brigade**

Trailer parks have been placed under the authority of the State Division on Housing by a ruling of Edmund G. Brown, California attorney general. The division is holding conferences with electrical contractors, utility companies, public officials and trailer park people in developing regulations. — **Gypsy rules**

Control of home lighting by dimmers was demonstrated to the American Institute of Decorators conference, San Francisco, April 21-25, by Superior Electric Co. luxurious "House on Wheels." It featured Luxtrol and a new table-top control unit that gives the homemaker the ability to dim or brighten fluorescent or incandescent lighting. — **Mood changers**

A construction materials center has been set up at 330 Clay St., San Francisco, as a "permanent home show and reference library in the construction and building field, containing both in-use and sample displays of every type of product used in home or commercial building." Open weekdays all day and Saturdays until 2 p.m., the idea is to offer the public a source of information about building materials and products, and to make sales referrals to exhibitors and their distributors. — **"See it yourself"**

"Wire Up and Live" is the clever cartoon-pamphlet offered by Channing L. Bete Co. Inc. of Greenfield, Mass., to use in promotion of adequate wiring. It sells for 15c each or in bulk quantities at 10c or less. — **Explainer**

Among interesting new products recently announced—Ideal Industries Inc. has some new wire strippers with an automatic feature that strips both solid and stranded wire in a one-squeeze operation . . . Slater Electric & Mfg. Co. announces a new quiet switch using no mercury with "Speed Wire" rear sockets for quick installation . . . McLean Engineering Laboratories of Princeton, N. J., tells of a free-floating attic fan for installation in attic walls, isolating the motor and fan on rubber mounts . . . Arrow-Hart & Hegeman has a new NEMA-type XII enclosure for magnetic starters and contactors made of stainless steel for food processing industries or where corrosive conditions exist. It also announces a new 20-amp interchangeable Quiette switch, the smallest available . . . Lightolier has added a number of colorful black and white striped parasols and hanging lanterns to its Lytescape series with particular application to garden lighting. — **Some new to you**

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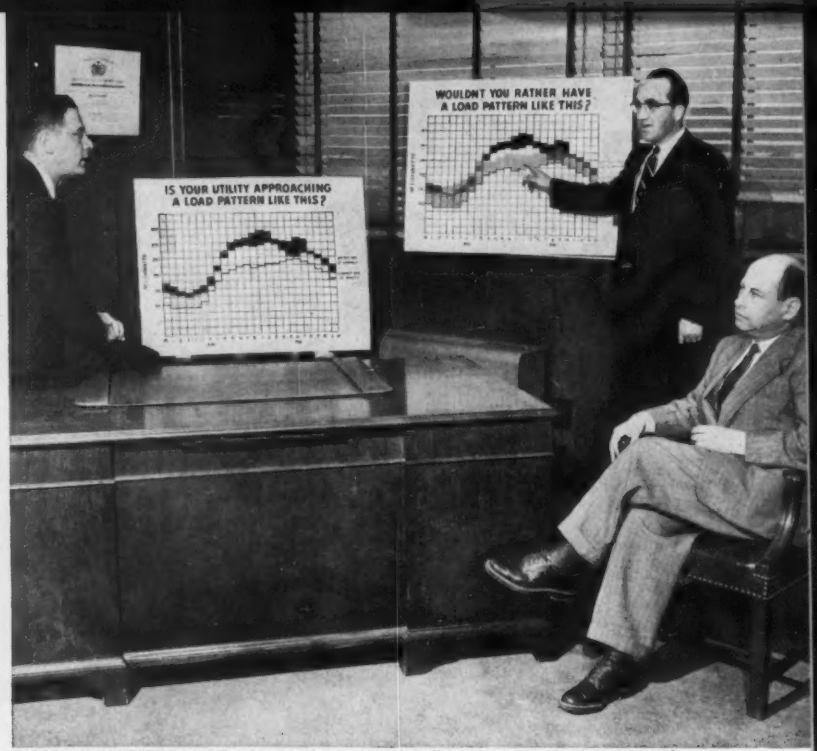
COMPLETE SALES TOOLS help utilities promote the heat pump. For details, contact the General Electric Co., Weathertron Dept., Bloomfield, New Jersey.

MORE G-E SALES AID is provided by Weathertronics Institute, where utility men, dealers and distributors get a week's training at the factory in all phases of the fast-growing heat pump business.



INCREASE IN WINTER LOAD added by heat pumps is indicated on chart by P. F. O'Neill (standing), Manager—Utility Contacts. H. L. Williamson (left), Manager—Marketing, and G. K. Marshall, Manager—Product Planning, also of the Weathertron Department, note that not only is winter load raised but that the light load periods in the daily load curve are raised also by heat pumps.

As commercial applications develop . . .

Utilities prepare for expanding heat pump market

Now that year-round air conditioning's popularity perimeter has surged into Michigan and southern New England, the picture of a relatively unpromoted market for the heat pump, the commercial one, is coming into sharp focus. General Electric's market analysts predict that the heat pump portion of the commercial and industrial year-round air conditioning market will more than triple in the next ten years. This becomes even more significant considering the accelerated growth of air conditioning in general. Add to this the fact that, to date, 1 of every 2 heat pump installations have been for commercial or industrial use—even without concentrated sales action—and the potentials become even clearer.

Throughout the electric utility industry, these statistics have helped spark widespread preparations that promise to make '56 the year of the "big push" in all customer classifications. The reason is simple: the heat pump offers utilities an attractive opportunity to gain winter kwhrs and offset summer peaks. Separate utility budget items to promote and sell heat pumps and the inauguration of budget billing in market areas are only two of the signposts.

At General Electric, too, efforts are reaching fever pitch. G.E.'s new Weathertron production line is now in full-time operation, doubling the Company's capacity. New designs have made Weathertrons more saleable to commercial and industrial as well as residential prospects.

Continued coordination of activities between electric utilities and manufacturers, like General Electric, should make 1956 the first big year in the heat pump bonanza. General Electric Company, Schenectady 5, New York.

301-320

MORE POWER TO AMERICA

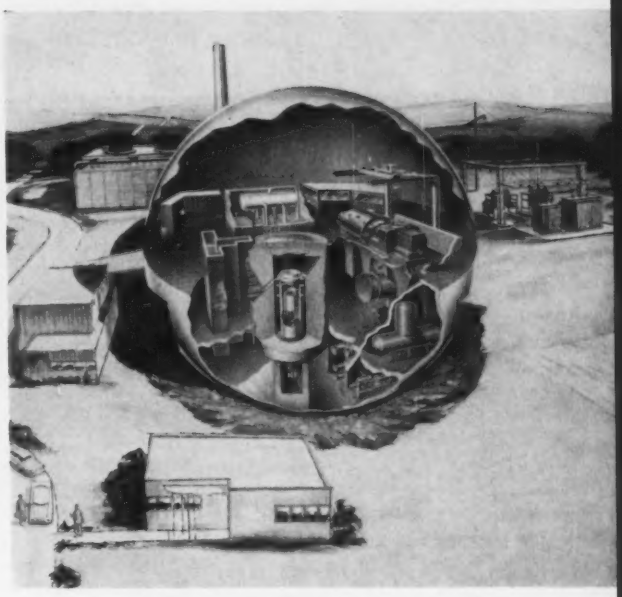
GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 116, NO. 5
MAY 1956

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

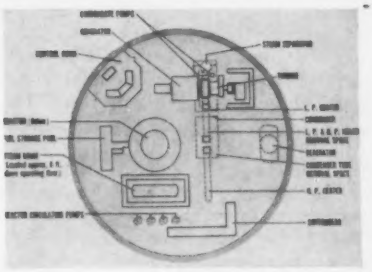
General Electric Co. recently announced plans to build an experimental reactor facility in the Livermore-Pleasanton, Calif., area. Steam from the nuclear reactor will drive a turbine-generator, provided and operated by the Pacific Gas and Electric Co., which in turn will send electric power into the PG and E transmission network. This design discussion of the first privately financed nuclear facility provides a preview of tomorrow's . . .



Small Atomic Stations

H. E. Grantz and M. C. Compton

Atomic Power Equipment Department
General Electric Co.



Cross section and plan of the proposed 10,000-kw nuclear power station to be built in the San Francisco Bay area

There is considerable evidence that a large immediate demand exists in this country and especially abroad for nuclear power plants in the 10,000- to 50,000-kw range. This article will discuss a reference design for a boiling water reactor power plant at the lower end of this range of small nuclear power plants.

Safety considerations have led to the adoption of a spherical containment vessel of a size sufficient to house the complete power plant inside the sphere. In this arrangement the reactor, condenser, air ejector, feedwater heaters, circulating pumps and the storage pool for spent fuel elements are all located below floor level. The steam drum is located above the reactor in a position to provide a sufficient thermal head for natural circulation of reactor coolant in event of loss of power. The turbine-generator, switchgear and control room are at floor level.

Accompanying photographs of a cross section and plan show the relative position of major components of the plant.

Estimated performance of the entire plant is illustrated by the heat balance diagram (Fig. 1). The estimated reactor heat output is 40,000 kw and the calculated plant net power output is 10,600 kw, which results in an over-all efficiency of approximately 26%. The plant is sized to produce 12,500 kw gross at .92 pf and above.

Turbine throttle pressure is approximately 600 psia, and the condenser operates at 3-in. Hg. The plant heat rate is approximately 13,000 Btu/kwh at its net over-all output of 10,600 kw. The estimated heat rate corresponding to the generator output of 11,500 kw is 12,000 Btu/kwh.

Reactor Details

One major advantage of the boiling water reactor is that the pressure in the reactor is approximately the same as the turbine steam pressure. This permits the use of a relatively light reactor pressure vessel and enables the design of a vessel head closure that can be removed quite easily for refueling. The reactor vessel (Fig. 2) itself is approximately 7 ft in diameter and 18 ft high to the top of the closure.

Water enters the vessel at a level above the core, flows downward through the thermal shield and vertically upward through the reactor core. Thus the water level would be above the core in the extremely remote event of a failure of the inlet pipe. A water-steam mixture is discharged from the side of the vessel to the steam drum.

The reactor core is composed of a series of fuel elements supported by upper and lower matrix plates. Control rod drives are mounted below the pressure vessel. These control rods will contain sufficient amount of control to override peak Xenon at all times, as well as to compensate for the decrease in reactivity due to rise in temperature and formation of voids at start-up.

Refueling

The fuel is slightly enriched uranium oxide. Calculations indicate that the reactor refueling period will be once every 18 months, assuming that the plant is operated continuously at rated power. However, it may be desirable for reasons of economy to refuel more often.

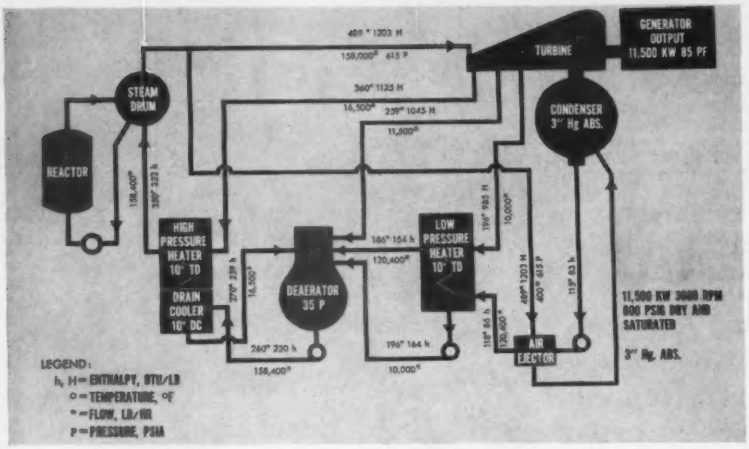


Fig. 1—Heat, balance diagram of the station

The proposed control system* for small power plants is based on the principle that the nuclear reactivity of the core is affected by the percentage of steam voids. Thus, by controlling the percentage of voids, it is possible to control the reactor power output. This is achieved by means of a variable capacity pump used to provide controlled forced circulation of the water coolant through the reactor core. The recirculated flow path (Fig. 3) is from the steam drum, through the pump and the reactor, and back to the drum.

In this system the pump output is varied to control reactivity. Shown in Fig. 4, the reactor power output and corresponding voids during steady state low power operation are shown at the left. As the pump flow is increased, the percentage of voids decreases and reactor power increases. As the flow is stabilized and the per-cent voids increased, the reactor power likewise stabilizes at a higher value.

48-Hour Refueling

Refueling of this new reactor is a relatively simple matter. It is estimated that the mechanical operations of completely replacing all the fuel elements with a new load can be completed in 24 hours. An additional 24 hours will be required to cool the plant thermally, and for the ensuing start-up operations.

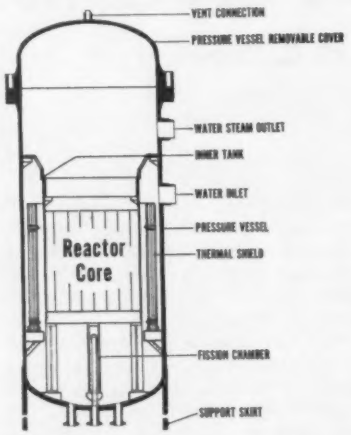


Fig. 2—Cross section of reactor pressure vessel

The following are the significant steps in the procedure of refueling this reactor:

1. Pure water is introduced in the tank above the reactor vessel. This serves as a shielding medium for the operating crew.
2. The top head of the reactor vessel is unbolted, removed and mounted to one side where it remains during the refueling operations.
3. A refueling grapple is inserted into the reactor core and the fuel elements removed one at a time. These elements are discharged from the reactor vessel through a chute into the adjacent water-filled storage pool where they are placed in racks.
4. New fuel elements are loaded directly into the reactor by means of a long grapple.
5. The reactor vessel head is replaced when the refueling operations have been completed. The shielding water is drained from the upper vessel and the reactor is ready for start-up.
6. The spent fuel elements remain in the storage pool for an appropriate decay period. Then a shipping cask is lowered into the pool and the fuel elements are transferred into the cask, which is then withdrawn and shipped to the reprocessing plant.

Preliminary Developments

A series of supporting development programs is now under way to obtain necessary design data for this type of plant.

These include a series of heat transfer and burn-out tests at heat fluxes far beyond those anticipated in actual operation. They also permit investigation of heat transfer characteristics under steady state and, more important still, under conditions of transient operations that will be encountered during rapid changes in power output.

In another series the hydraulic flow characteristics of the reactor core and of the reactor system in its entirety are being checked. In still another, control drive mechanisms under actual condi-

*This system differs from G-E's dual-cycle boiling water reactor for large stations.

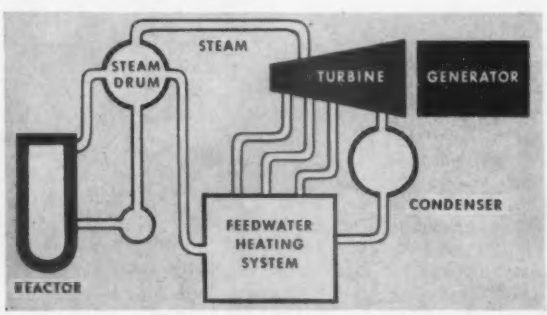
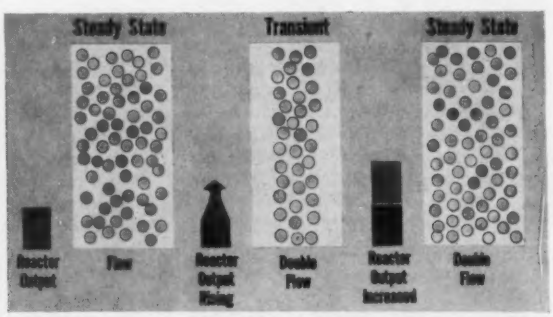


Fig. 3—(left) Schematic diagram of the steam cycle showing the forced recirculation feature through which control of the reactor is effected. Fig. 4—(right) Diagrammatic explanation of the forced circulation control principle



tions of pressure and flow are being studied. The latter setup will demonstrate actual operating characteristics of control rods and drives, and enable determination of their endurance by a series of life tests.

Corrosion test loops are being constructed. These are necessary to investigate corrosion rates, foreign material deposition and other phenomena associated with the reactor and primary loop materials under consideration.

Cost Data

The cost of generating electrical energy in an atomic power plant has been the subject of considerable speculation. Data appearing herein are believed to be a conservative estimate of the performance to be expected from smaller nuclear power stations.

Fig. 5 illustrates the effect of the fixed charge rate on the cost of generation, as well as the dominant effect that load factor and cost per installed kilowatt have upon the fixed charges. For purposes of this discussion, a range of installed costs from $450 per kw to $550 per kw (excluding the site) has been selected. At a 14% fixed charge rate and an 80% load factor, fixed charges ranging from 9 mills to 11 mills per kwh result.

Other costs, in addition to the fixed charges, which go to make up the total generation cost are shown in Fig. 6. Recent power plant surveys indicate that single-unit plants of this size can be operated with personnel amounting to 1½ to 2 men per megawatt-day, equivalent to a personnel charge of 1.5 to 2 mills per kwh. While it is anticipated that the reactor-turbine combination will be relatively simple to operate, the requirements for additional personnel must be considered so that necessary health-physics work and plant security can be maintained. At the present time, this requirement would tend to favor the higher portion of the range shown.

Power plant maintenance costs for conventional steam plants of this size have been averaged at about .67 mill per kwh. Until the plant, which has been described, is actually in operation, exact maintenance costs will be unknown but are estimated to be from 1½ to 2 times those of a conventional steam station, probably from 1 to 1.4 mills per kwh. Periodic rearrangement of fuel within the reactor core might be considered an item of routine maintenance. All pumps, valves, seals, etc., must be maintained in as nearly leakproof condition as possible and such precautions as these would tend to somewhat higher maintenance costs.

Net estimated fuel cost varies with the length of burn-up time, which is considered. The 4.2 mills per kwh shown in Fig. 6 are based on 10,000 mw-days per ton energy extraction and the 5.9-mill figure is based on 3,000 mw-days per ton energy extraction. These figures include estimates for the cost of fuel processing, the credit for plutonium and the inventory charge for one-core leading plus six months supply. The estimates of fuel costs shown here are intended to be conservative. Technological developments in the next few years almost surely will result in considerably lower fuel costs than those estimated above. Based on the plant design described, fuel costs would be comparable with fossil fuel costs of from 32c to 45c per million Btu.

In summary, the estimated cost of power generation in the atomic power plant of the size herein described would range from 15.7 to 20.3 mills per kwh. Figs. 7 and 8, however, give a glimpse of possible future power plant costs and costs of generation. The mean curves shown can vary either up or down, depending on the location of the plant, type of labor involved and other variations that occur in conventional power plants. It is obvious that these costs must and will be reduced in years to come. Factors that will bring this about include the prorating of development costs over a greater number of plants, as well as reductions in methods of containment, shielding, etc.

The cost of power generation will decrease as experience is gained in operation. In addition to the reduction in capital costs, as indicated in Fig. 6, additional operating experience will tend to reduce the required maintenance. The number of personnel required for proper operation of an atomic plant will decrease, and it must be expected that the cost of fuel will be reduced. This look into the future forecasts power generation costs from plants of the 10,000 to 50,000 class at 13.4 mills/kwh.

This trend also will be carried along on plants of larger ratings, permitting them to approach more closely the generation costs of conventional steam stations.

Inquiries from foreign countries have shown that there is an immediate market for plants of the type described. This is particularly true of areas where fuel costs are unusually high and where there are natural resources to be extracted or other industries to be carried on. The development of this market, coupled with the research and developmental power stations here in the United States, will enable us to develop better reactor systems sooner—systems that will approach even closer to the competitive target set by our present highly efficient and economic conventional power plants.

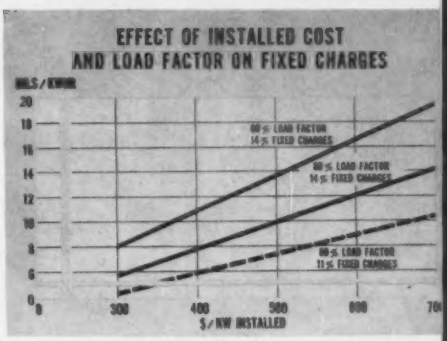


Fig. 5

ESTIMATED COST OF GENERATION
11,500 KW NUCLEAR POWER PLANT
80% LOAD FACTOR

COST - MILS/KW - HR	LOW	HIGH
FIXED CHARGES	9.0	11.0
PERSONNEL	1.5	2.0
MAINTENANCE	1.0	1.4
FUEL	4.2	5.9
TOTAL	15.7	20.3

Fig. 6

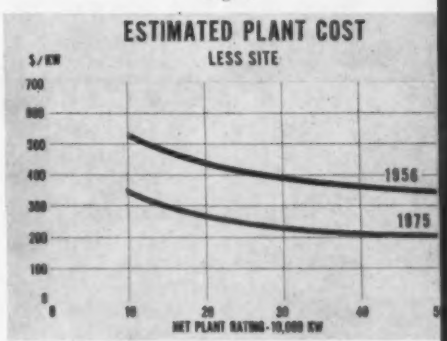


Fig. 7

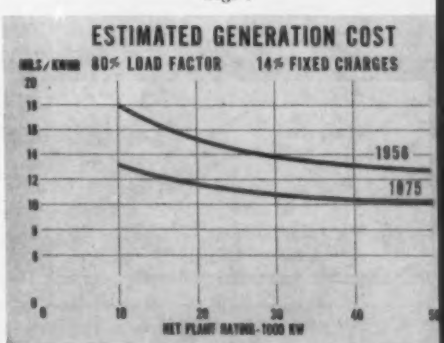
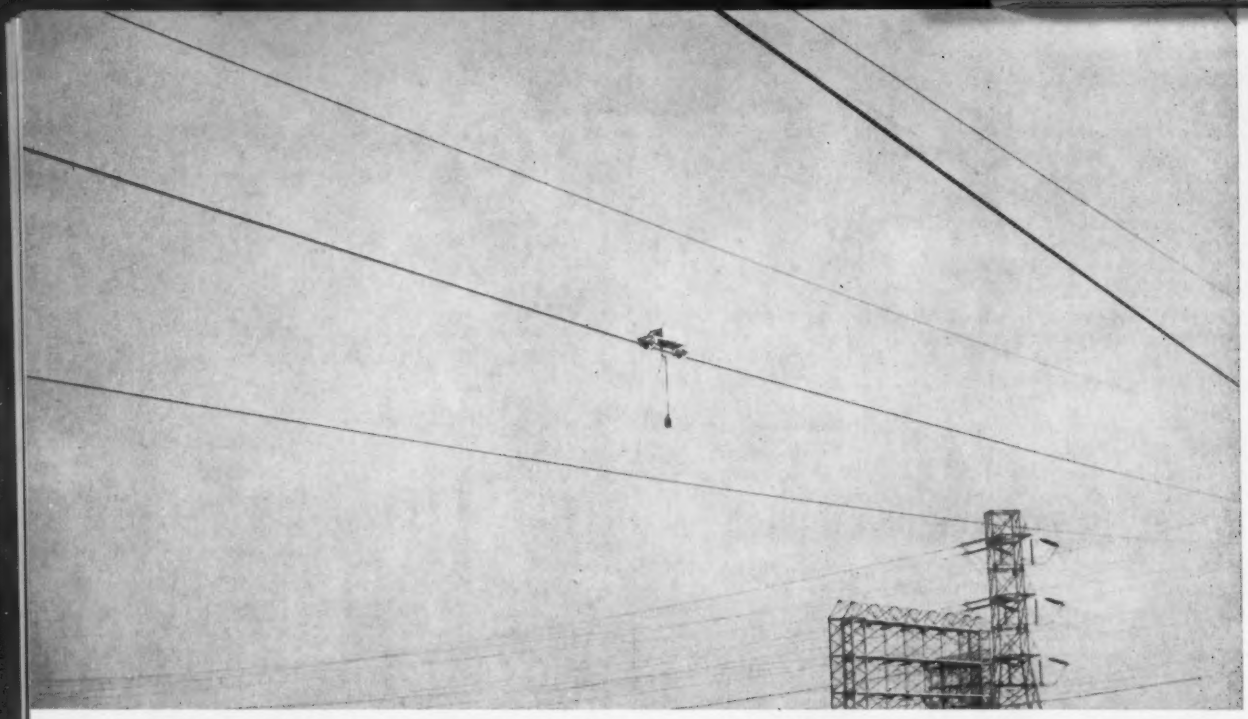


Fig. 8

From top: Fig. 5—Effect of installed cost and load factor on fixed charges; Fig. 6—breakdown of estimated cost of generator for the small nuclear power plant; Fig. 7—estimated plant costs, now and in 1975; Fig. 8—estimated present cost of generation (see Fig. 6) and in 1975



Old ACSR transmission conductors are greased with coal-tar cut back to prevent corrosion. Application is made from tank mounted on groove-wheeled carriage that is pulled from the ground with a long cord. With adequate clearances, job may be done on hot lines

Grease is the answer to

Preventing Corrosion in ACSR

Jordan Lummis

Distribution Superintendent
Southern California Edison Co.
Los Angeles

Cost of copper has now reached such stratospheric heights that a foot of scrap conductor will sometimes buy more than two feet of equivalent ACSR. At present costs there are actually circumstances where we could pull out old copper, replace it with new ACSR and have a little money left over. This is not intended to suggest what should or is even likely to be done but it is a dramatic statement of an economic condition that is having a tremendous influence on power line economics.

These economics have noticeably diminished the vociferous objections to aluminum conductor that have caused some prospective users to shun the metal even though there was no cause for concern. On the other hand, aluminum is just as susceptible to flashover burns, vibration damage, creep instability and corrosion as it was when copper was less cherished; and to minimize these facts may induce fools to rush in where angels tread only with caution. Obviously, for the savings involved, we could put up with some repair work, but this is largely needless because the troubles can be minimized if we are willing to spend a little to save much.

The corrosion of aluminum is a critical problem in conductors not because aluminum is substantially more subject to corrosion than copper but because the products of aluminum corrosion are nonconductive. The resistance of any metal to corrosion is, of course, a relative matter, since any commercial metal is susceptible when conditions are right but the behavior of aluminum is rather paradoxical. It is one of the most stable of metals, yet raw metal exposed to air oxidizes almost instantly. Pure aluminum, free from the influence of other metals, endures remarkably in almost any exposure; alloyed aluminum or pure aluminum in contact with other metals lasts well enough in dry, clean atmospheres but in humid, contaminated conditions the effect of a combination of metals can be pernicious. It seems not to be generally realized that any common alloying agent reduces aluminum's resistance to some extent. This applies to copper, zinc, iron, manganese, nickel, lead, silicon or chromium whether incorporated in the molecular structure or merely in external contact.

The two variables that affect the degree of corrosive activity are environment and the foreign metal. Both of these are to some extent controllable; foreign metals by carefully selecting the more resistant alloys and eliminating bimetallic contacts, and environment by excluding moisture and aggressive contaminants. If Southern California Edison's 43-year experience with ACSR transmission lines can be taken as a criterion, the solution is not difficult.

Solution Not Difficult

Edison's first 240 circuit miles of ACSR were built in 1913 and by 1920 this mileage had doubled. In 1930 this had increased to 824. In 1940 the total was 1,132 and at present there are 2,382 circuit miles of ACSR on the transmission system, and experience totals something in the order of 50,000 circuit-mile years. In every one of these lines the conductor is still serviceable, although there must have been times in the past when this seemed a doubtful consequence because the older lines

have suffered all the disorders that power lines are heir to. However, by reason of wisdom, good judgment or just plain fortuity Edison was early in recognizing the corrosion problem and early sought for the solution in moisture-excluding compounds. Of course, they were neither sagacious nor lucky enough to find the ideal compound at once, and once found they could not establish that fact without many years of trial.

Starting in the early twenties field trials were made of every goop that science could create or ignorance invent. Trials were made with red lead paste, petroleum wax, battery seal, zinc chromate paste, glazing putty, axle grease, coal tar, asphalt, proprietary nostrums and in fact anything that appeared to be insoluble in water and did not cost too much, with preference being given to matter which stuck to the hands and could not be removed from clothing. All of these substances prevented corrosion for a time but only for so long as they remained in their original condition.

Asphalt, for instance, cracked as it dried, with the result that moisture entered the crevices. Again, the linseed oil vehicle in red lead paste oxidized and the oxidized products forced the contact surfaces of the fittings apart with a nonconductive material. Subsequent heating further dried and oxidized the vehicle to the extent that cracks were formed, moisture entered and corrosion proceeded at an accelerated pace. This, by the way, is a characteristic of the same vehicle that is used in zinc chromate paste now so popular. The end result will inevitably be the same as that which occurred with red lead.

The less effective compounds began to fall by the wayside within ten years and after 15 years the group was narrowed down to three stable substances. One of these was a penetrating coal-tar cut back, one an aluminum-stearate petroleum grease and one a petroleum wax. Experience with each of these has now exceeded 25 years on thousands of connections without any indication of deterioration. No fitting treated with any of the three compounds has subsequently shown any sign of corrosion, nor has any such fitting ever given any indication of increased resistance.

The group was eventually narrowed down to two by the elimination of the petroleum wax. While the service record of the wax was just as good as that of the grease, the melting point of the wax is about 150 F while that of the grease is about 250 F, well above safe operating temperature of conductor.

The grease and the coal-tar cut back serve two distinct purposes. The coal tar is used on old, untreated fittings or on old, untreated conductors where its penetrating qualities cause it freely to permeate the interstices to be protected. The aluminum-stearate grease is used on new work where it can be stuffed into fittings at installation or packed into conductor during stranding. In the most corrosive regions it is thinned down and sprayed over the surfaces of aluminum-alloy hardware.

Conductor packed with grease is a relatively new development for Edison, the oldest being a span which has now been under accelerated test for about 42 months. The test conductors are treated with various compounds beside the grease and there is an untreated conductor for control. The cables are close to the ground and within 100 yards of the beach where temperatures are relatively high and where they are exposed to dust, traffic fumes, on-shore winds and frequent spray from the ocean. The greased conductors are still in the same conditions as when new, but all others are corroding at a rapid rate.

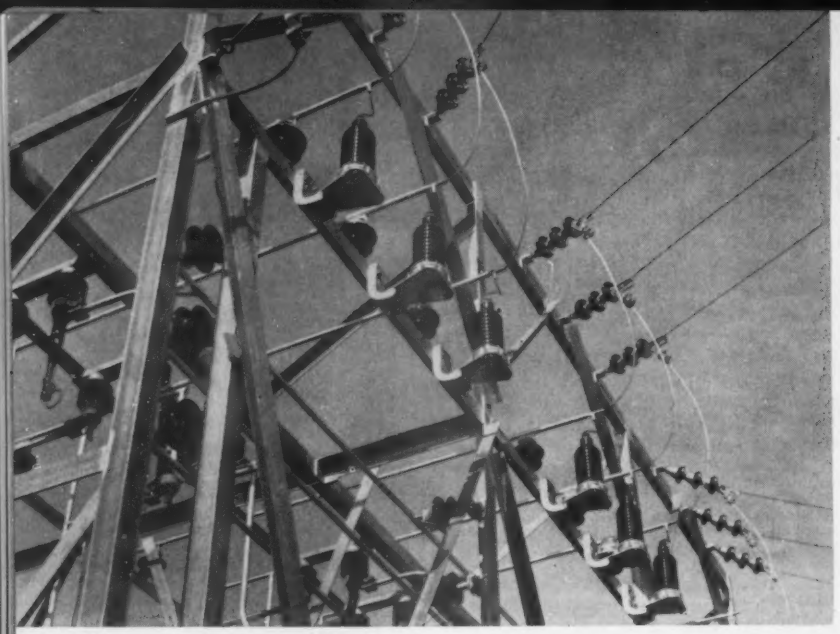
In the meantime, there being sufficient reason to believe that results can be anticipated and the test span a mere formality, more than 3,000,000 lb of grease-packed ACSR have been purchased for use on transmission lines in areas formerly considered too corrosive for aluminum. There has resulted a saving of about $1,500,000 in conductor cost alone plus savings in structure and erection charges that are substantial but less easy to evaluate.

Unfortunately boundaries of regions where aluminum is attacked by corrosion are not static but seem to spread, to some extent, with population. Southern California's tremendous growth has been paralleled by an equally phenominal growth of the corrosion problem. Whether this has been caused by increased combustion products, or an unusually adverse cycle of *unusual* meteorological conditions or more obscure esoteric factors depends on the point of view of the observer. Nevertheless, the consequences are clear because aluminum used to be seriously attacked only within a narrow strip fronting the coast but attack can now be expected anywhere within the entire basin. The air of the entire region now seems to carry contaminants that are almost as active as salt spray from the ocean and corrosion which used to be confined to old untreated fittings, or fittings treated with inadequate experimental compounds, has spread to the conductor itself.

Here is a case where it is too late for the ounce of prevention, but where a remedy can be effected with not much more than an ounce of cure because the corrosion can be arrested by the coal-tar cut back. Application is made from a tank mounted on a groove-wheeled carriage that is pulled from the ground with a long cord. The rate of flow is preadjusted and the flow can be cut off at any time by another cord leading to the ground. On transmission lines, where clearances are adequate, the job can be done with the line hot if circumstances warrant.

Greased connection after 25 years of service

Here is swelling resulting from internal corrosion started by an aluminum-alloy damper



Aluminum members field welded reduced substation cost. View shows compression fittings welded to the aluminum bus for termination of line conductors and lightning arresters

Costs are less with

Welded Aluminum Sub

Fred L. Lehman
Dean Athay
Clark County PUD
Vancouver, Wash.

An all-aluminum, all-welded substation structure, built by the Clark County Public Utility District in the fall of 1955, proved so successful that other similar welded structures are planned. This substation is located in the Salmon Creek district of Clark County, approximately six miles north of Vancouver, district headquarters.

The station was designed for an installed capacity of 10,000 kva. Voltage transformation is from 69 kv delta to 12.45/7.2 kv wye. There are separate high- and low-voltage structures. The high-voltage structure supports a dead-end span of limited tension, a three-gang air break switch, fused cutouts and lightning arresters. The low-voltage structure has a station-type bus regulator, three oil circuit breakers and a transfer bus arrangement. It feeds three 12.45/7.2-kv distribution feeders.

Aluminum alloys were selected for the structural material because of several factors:

1. Ease of cutting and assembling the structures.
2. Less detailed engineering required on the structural members.
3. Elmination of rust and corrosion problems because of drilling and cutting where galvanizing would ordinarily be ruptured.
4. Favorable costs of aluminum structural materials as compared to galvanized mild steel prefabricated structures.
5. Lower maintenance costs over long periods of time.

For structural materials the alloy selected was 6061-T6 with a yield strength of 40,000 psi for bus work, 6063-T6 with 55% conductivity, and for bolts 2024-T4 with a yield strength of 60,000 psi. Bolts were used for attaching insulators, switches and other equipment. Oxide inhibiting pastes were used where galvanized parts came in contact with the aluminum surfaces.

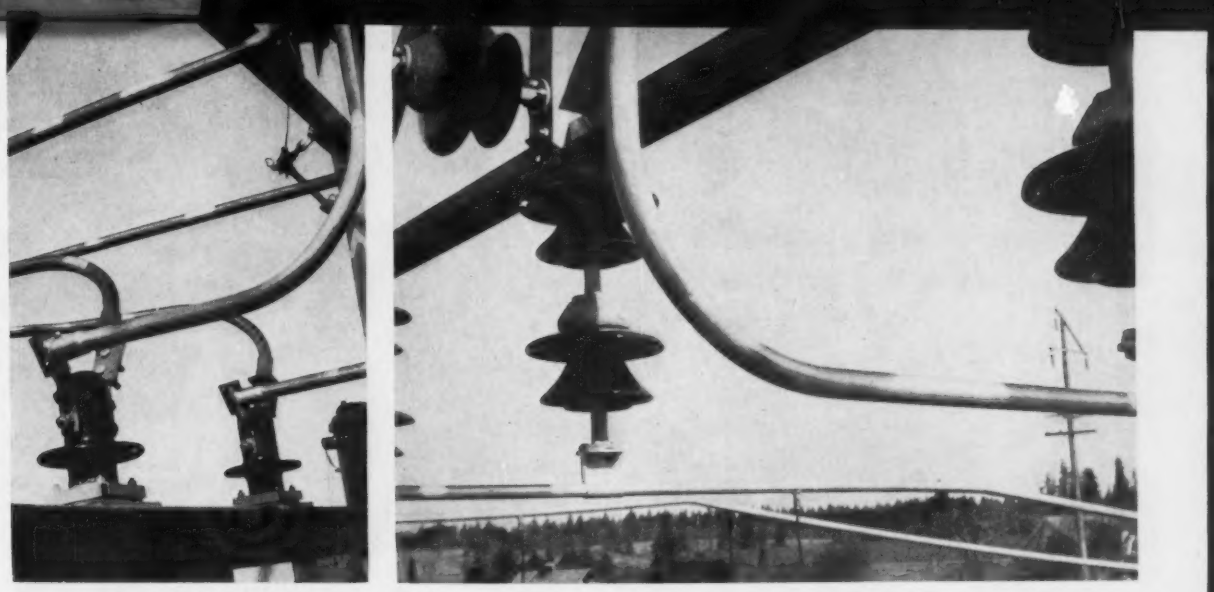
For design purposes conductor tension was limited to 1,000 lb per conductor on the high-voltage structure and to 600 lb per conductor on the low-voltage structure. For vertical members on the high-voltage structure 8x2.527-in. by 6.47 lb/ft channels were selected with 3x3x⅜-in. structural angle bridging. Horizontal members for the walkways, top section and cutout supports are 7x2.194-in. by 4.23 lb/ft channels. Horizontal bridging is 4x4x⅜-in. structural angles. Bus work on both high- and low-voltage sections is 1-in. extra-heavy ips tubular aluminum conductors. The low-voltage structure was constructed with primary members of 4x4x⅜-in. structural angles and 3x3x⅜-in. structural angles for braces and bridging. Members were cut to length and assembled in the field. All cutting and drillings were done at the job site.

The members were cut with an ordinary carpenter's portable hand saw with a 7¼-in. hardwood flooring blade. The blade required resharpening as frequently as if cutting wood. This saw was also used to cut welds when errors had been made. This worked very satisfactorily. The blade can be set to cut any desired depth up to 2¼ in. Butt welds and severed welds were dressed down with a lead file. Where it was necessary to drill holes for bolts, ⅛-in. pilot holes were first drilled. This was necessary since the larger drills had a tendency to drift if no pilot hole existed.

The type of welder used was an Airco-matic inert gas shielded arc welder with consumable electrode. It was supplied by the Air Reduction Co. of Portland, Ore. This welder employs a consumable electrode fed at a preset speed. The arc is surrounded by an argon atmosphere. This type of welding is very fast. It concentrates a great amount of heat in a very small area. Very good penetration of the parent metal at the weld is thus obtained. This was verified by cutting several welds and visually observing the weld penetration. Members butt welded together would buckle or bend when tested before welds would fail. In all cases welds showed a high degree of ductility. No instances were found where welds have developed cracks or have failed after erection.

Method of construction employed was to fabricate as much of the structure as possible on the ground. A flat bed of timbers was laid out as a work surface. The high-voltage structure was assembled in sections. The ends, walkway, cutout and top sections were individually constructed and then lifted into place and welded together. This worked very well and minimized the number of aerial welds. Since the arc must be surrounded by inert gas, it was necessary to shield it from air disturbances. The three-bay, low-voltage structure was made by welding the vertical bay partitions together on the ground. Horizontal front and back cross members were then welded in the air. All bus supports and bus connections were formed and welded in the field.

After several sections were fabricated, a line truck was used to lift them into place. Individual sections were



Shown above are details of how 69-kv bus supports were fabricated and manner of making bus connections to current transformers

temporarily held in place with ropes. The sections were then fitted together, clamped and welded. A ladder truck was used to convey the welder in making the aerial welds. The welding assembly housing the welding rod reel and controls was supported from the top of the structure by two sets of rope blocks. Its position could thus be shifted both horizontally and vertically as required during assembly of the sections.

Scrap Minimized

Another advantage of field welding was the minimizing of scrap material. Short pieces were butt welded together and used where they would otherwise have been scrapped.

Approximately 110 man-hours of welding time went into the fabrication of both structures. Most of the construction time went into cutting and polishing the weld areas and clamping the members into place.

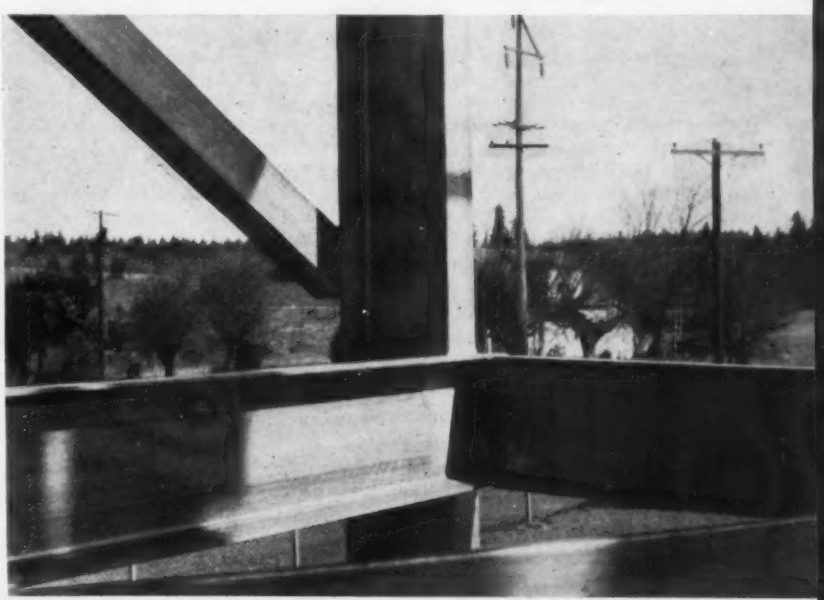
Many of the major problems encountered in construction have been mentioned previously. The most difficult field problem is shielding the welder from moisture and air disturbances; however, this can be overcome under most conditions. On extremely windy days and during rainy weather operations should be limited to work other than welding. But, since actual welding time is small, the interference to work because of inclement weather is negligible during spring and fall months and almost nonexistent in summer.

The method used to connect the 2/0 ACSR distribution lines to the aluminum bus was to weld a Burndy compression sleeve to the end of the bus. The 2/0 ACSR was dead-ended on the top of the structure and the tails of the lines were then compressed onto the lines. Similar sleeves were welded to the frame of the structure to pick up the system neutral and ground connections.

The district considers this type of aluminum structure to be most satisfactory. A welder of the type previously mentioned has been purchased by the substation department and is being used on other projects now under construction.

At present a six-bay, low-voltage structure is being constructed at the district's McLoughlin Heights station and an additional bay is being added to the existing structure at the Camas station. Other such installations are planned for the near future. All will be welded aluminum structures.

Station grounds were made by welding Burndy compression fittings to footing plates



View showing field welds of aluminum structural shapes made with an inert gas welder

These men are attending school conducted by Soil Conservation Service to receive instructions for making 1956 Western snow survey

Western snow survey shows

Heavy Runoff Expected

Homer J. Stockwell

Snow Survey Supervisor, Soil Conservation Service
Fort Collins, Colo.

Norman S. Hall

Snow Survey Supervisor, Soil Conservation Service
Reno, Nev.

Extremely heavy season streamflow is expected during the snow melt season of 1956 in the northern half of western United States. Shortages of water will continue in the drought areas of Arizona and New Mexico where water supply from streamflow is forecasted at only one-quarter of normal. Between these two extremes the water supply outlook is near normal except for local shortages in relatively small areas of Utah, Colorado, Nevada and in southern California.

This April 1 West-wide report is based on snow surveys, reservoir storage, soil moisture in mountain and irrigated valley areas and other factors affecting runoff for the coming season. The amount of runoff affects power operations, municipal and industrial use and irrigation planning throughout the West. Therefore, this information is compiled each year for ELECTRICAL WEST by the Soil Conservation Service of the United States Department of Agriculture. Runoff predictions are made from data gathered by that agency and its cooperators on about 1,250 snow courses in the western United States and British Columbia.* With this report the U. S. Department of Agriculture and Soil Conservation Service completed 21 years of snow surveys and water supply forecasting in the West.

In the Northwest, the flow of the Columbia River, its tributaries, and on streams adjacent to the basin will be much above normal. April-September 1956 volume flow of the Columbia River, as measured at The Dalles, is expected to equal any recent year including 1948. The water supply prospects dropped to an extreme shortage in New Mexico and parts of adjacent states.

The outlook for hydroelectric power production on snow-fed streams is improved over a year ago in most areas of the West. More water will be available on the Columbia River, the upper Missouri of Montana, Yellowstone River tributaries in Wyoming and on the Platte River systems of Wyoming and Colorado. The flow of streams on both sides of the Cascade and Sierra Nevada Mountains in Oregon, California and Nevada will range up to 35% above normal and much higher than for a year ago. Lake Mead is at the lowest level since the original filling in the late 1930's; a little over one-third of capacity. Inflow this year will be about average at 10,000,000 acre-ft for the April-September period. This will not materially improve the outlook for Hoover Dam over a year ago, but this year's inflow is expected to equal the combined flows of 1954 and 1955.

*The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Forest Service, Geological Survey, other federal bureaus, various departments of the several states, irrigation districts, power companies and others. The California State Division of Water Resources, which conducts snow surveys in that state, contributed the California figures appearing in this article. The Water Rights Branch, British Columbia Department of Lands and Forests, has charge of the snow surveys in that province and contributed the information here for British Columbia.

Summary of Water Conditions

After relatively heavy early winter snow the water supply prospects in the Rio Grande in Colorado and New Mexico have declined to much less than normal and are only slightly improved over 1955. Increasing use of underground water must be planned; crop acreage will again be curtailed. Prospective runoff into Salt River Valley reservoirs, along with other streams in Arizona, ranges from 10 to 40% of normal. The outlook is similar to a year ago. Nearly all stored water is expected to be used in 1956. Extensive pumping must be continued.

The Central Valley of California will have above-normal streamflow in most areas. Local shortages will occur on southern sections of the San Joaquin Valley irrigated areas not served by diversions from the north. Natural runoff in the South Coastal region will be light. To meet requirements, heavy demands will be made on the Colorado River.

Adequate supplies will be available to meet demands along Upper Colorado River and its tributaries in Colorado, Wyoming, New Mexico and northern Utah. In southern Utah some shortages will occur on the Colorado River and Great Basin, with an extreme shortage expected on the Sevier River. Northern Utah will have near-normal supplies. Irrigation supplies are excellent on the eastern slope of the Sierras in Nevada and good along the Humboldt River. Reservoir storage is near normal.

The outlook for the Platte River in Colorado, Wyoming and Nebraska has improved over the past two years. Total supply is near average and will be adequate to meet requirements in all but those areas with marginal irrigation rights and heaviest demands. The flow of the Missouri River tributaries in northern Wyoming and western Montana will be about 25% above normal, and 50 to 60% above that for the 1955 season.

Snow pack on the Columbia River basin is extremely high. Many snow courses have record-high measurements as of April 1, 1956. Water supplies will be abundant along all major streams serving irrigated areas in all of Idaho, Oregon, Washington, and in northwestern Montana. Carry-over storage in reservoirs is close to normal. Many reservoirs are being lowered in anticipation of extremely heavy inflows to come. Mountain soils over the basin are generally wet.

Forecasts for major streams of the West for the April-September 1956 period include the Columbia River at The Dalles at 131,000,000 acre-ft or 135% of normal; Missouri River at Toston at 2,850,000 acre-ft or 126% of normal; Colorado River at Grand Canyon at 10,000,000 acre-ft or 99% of normal; and the Rio Grande at Otowi Bridge at 375,000 acre-ft or 45% of normal. These forecasts indicate the general water supply outlook for the major streams of the West.

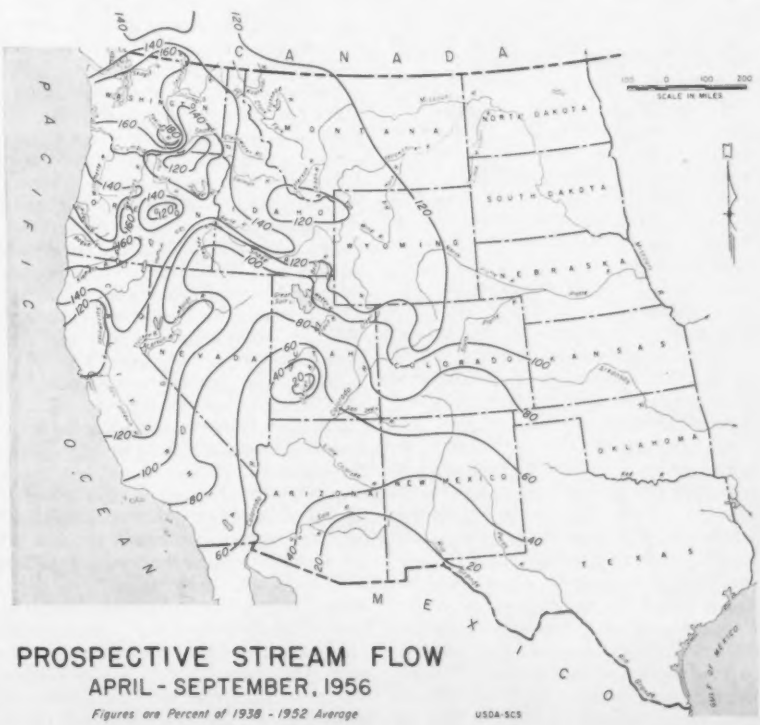
In the following paragraphs the water supply outlook is briefly reviewed by states. A chart showing the status of reservoir storage in each state and a map indicating the approximate runoff forecast summarize the 1956 outlook for each area of the West.

Arizona—Arizona's outlook is the poorest since 1938. Runoff forecasts are for flows that continue the pattern of the past several years, ranging from 10 to 40% of the 1938-52 average. With reservoir storage at only about 20% of capacity and 60% of normal for April 1, it is apparent that a season of very deficient water supplies is ahead. Prospective supplies appear adequate to carry the Salt River Valley through summer irrigation, with little or no carry-over storage to remain at the end of the season. San Carlos project faces a continuation of the very deficient supply it has had for several years. Pumpage can supply only part of the needed water. Almost all other Arizona areas face substantially the same situation. Normal water supply is anticipated only for projects along the Colorado River main stem, including the Yuma and Wellton-Mohawk Valleys.

British Columbia—According to the British Columbia Water Rights Branch, most of the snow courses in the Columbia, Kootenay, Okanagan-Similkameen and Skagit River basins have water content which averages about 35% above normal. The low-level snow courses show the greatest amount above normal. Thawing appears to have started in the most southern areas. April to September streamflow in these areas is expected to be well above normal. Flows greater than last year, but not as great as in 1954, are expected.

Snow pack in the Fraser and North Thompson River basin is heavy, particularly in the North Thompson which is more than 40% above normal.

California—Water supply conditions in California as of April 1, as reported by the State Division of Water Resources, are generally satisfactory north of the latitude of Bakersfield. Though precipitation was considerably below normal during February and negligible during March, the record-breaking storms in December and January resulted in sufficient snow pack and surface reservoir storage to provide above-normal water supplies for this portion of California. Shortages in water supply are anticipated only in localized areas where development of conservation storage and groundwater basins has not kept pace with growth. In the remainder of the state, conditions are generally satisfactory. Pumping from groundwater basins supplemented by supplies conserved by facilities of the Central Valley Project and on the Colorado River will alleviate to a large extent shortages in local surface water supplies. However, the available supply for agricultural areas in the vicinity of San Diego will be greatly deficient. The demand on groundwater basins to compensate for the deficiency in surface supplies will further aggravate overdraft conditions in basins located in the western and southern portions of the San Joaquin Valley and in the South Coastal area. Unless provision is made in the near



PROSPECTIVE STREAM FLOW
APRIL - SEPTEMBER, 1956
Figures are Percent of 1938 - 1952 Average
USDA-SCS

future for further supplemental supplies a critical situation will result.

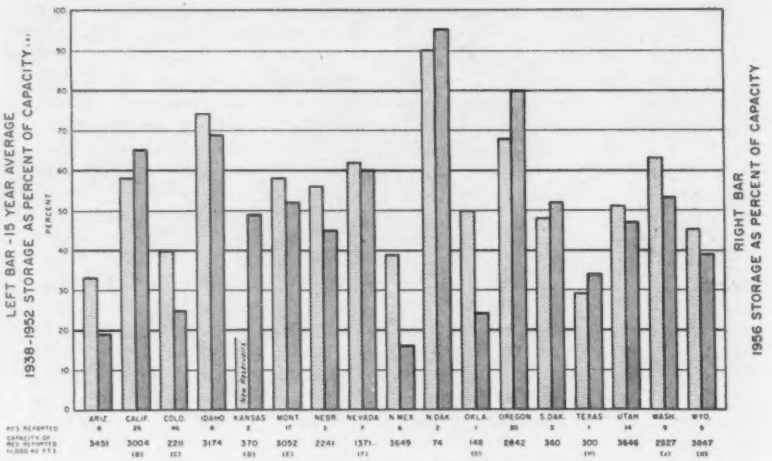
There were no storms of consequence during March. Those that occurred during the last few days of the month brought only normal amounts to scattered portions of the state north of the Tehachapi Mountains. However, seasonal precipitation as of April 1 averages above normal in all the major hydrographic areas of California, except the South Coastal which is generally greater than for the same period one year ago.

The water content of the snow pack in the Cascade Mountains and Sierra Nevada varies from 20% normal on the Tule River to 150% normal on the upper Sacramento and Feather River watersheds. The March storms deposited only minor amounts of new snow and the water content of the snow pack is generally less than that of March 1 as a result of some melt which occurred during the latter portion of March.

New high river flows were reported on many streams during March. However, reported inflow to Shasta, Folsom and Pine Flat Rivers indicated major increase in flow during March due to snow melt in the upper reaches of the respective tributary watersheds. Snow melt runoff on the Cascade Mountains and Sierra Nevada streams will be considerably in excess of that during 1955. The anticipated snow melt runoff, assuming normal precipitation during the April-July period, is expected to vary from 60% of average in the Tule River to 156% on the Feather River and on most streams will be approximately double that for 1955.

Colorado—Except for the Rio Grande, the outlook for the state is much improved over the past two years. Early season snowfall was much above normal throughout the state, but increase in the snow pack during March was small and warm temperatures caused premature melting. On the Colorado River drainage, mountain soils under the snow are wet. Streamflow is increasing. While the snow pack has melted to some extent at medium elevations of the eastern slope, wet soils and increased streamflow are not in evidence.

On the South Platte drainage in northeastern Colorado, snow-melt season streamflow will range from normal to about 25% above normal. Along the Arkansas River, the available supply will be nearly 75% of normal. Supplies will be generally adequate along the main streams of the Colorado River drainage. Streamflow should range from 75% of normal in southwestern Colorado to 125% of normal on the Upper Colorado River near the Continental Divide. Inflow


LEFT BAR - 15 YEAR AVERAGE
1938-1952 STORAGE AS PERCENT OF CAPACITY
RIGHT BAR
1956 STORAGE AS PERCENT OF CAPACITY
ARIZ. CALIF. COLO. IDAHO KANSAS MONT. NEBR. NEVADA N.MEX. N.DAK. OKLA. OREGON S.DAK. TEXAS UTAH WASH. WYO.
3451 3004 2211 3174 370 3052 2241 1371 3649 74 148 2842 360 300 3846 2827 3847

RESERVOIR STORAGE AS OF APRIL 1, 1956

Explanation: (a) Most state averages for reported reservoirs are for a 15-year period (1938-52) but in a few cases reservoirs with shorter records have been included; (b) does not include Shasta, Millerton, Isabella, Folsom or Pine Flat reservoirs (combined capacity 7,601,800 acre-ft), April 1, combined storage 5,127,630 acre ft; (c) does not include John Martin reservoir on the Arkansas River (capacity 655,000 acre-ft), April 1 storage 44,000 acre-ft; or Granby, Horsetooth and Carter Lake of the Colorado-Big Thompson project (combined usable capacity 756,000 acre-ft), April 1 storage 153,400 acre-ft; (d) Cedar Bluffs and Kirwin reservoirs; (e) does not include Fort Peck reservoir (capacity 19,000,000 acre-ft), April 1 storage 4,990,000 acre-ft, or Flathead Lake (capacity 1,791,000 acre-ft), April 1 storage 710,000 acre-ft, or Hungry Horse reservoir (capacity 3,500,000 acre-ft), April 1 storage 2,034,000 acre-ft; (f) does not include Lake Mead (capacity 27,217,000 acre-ft), April 1 storage 10,720,000 acre-ft; (g) W. C. Austin reservoir (new in 1945); (h) Red Bluff reservoir on Pecos River; (i) irrigation reservoirs only, does not include Roosevelt Lake (capacity 5,072,000 acre-ft), April 1 storage 4,047,000 acre-ft, or Grand Coulee equalizer (capacity 761,800 acre-ft), April 1 storage 452,000 acre-ft; (k) does not include Boysen Dam (capacity 758,000 acre-ft), April 1 storage 3,000 acre-ft

to Lake Mead is expected to be near average; approximately equal to the total combined flow of 1954 and 1955.

The outlook for the Rio Grande drainage in Colorado is slightly improved over the past two years, but the supply will be less than normal and short of demand. This will further complicate interstate divisions of waters from this stream.

Soil moisture in irrigated areas is good on the west slope and fair to good in eastern Colorado. This represents a material improvement over 1955.

Idaho—Northern Idaho has a record-breaking snow pack with probability of excessive high flow on the Kootenai, Clearwater, Salmon and Payette Rivers. Boise River also has an extremely heavy snow pack, but skillful reservoir operations are expected to control its flow in 1956.

In southern Idaho average supplies are forecast. The drought that had prevailed for several years is definitely broken. Reservoir storage is good throughout the state as a result of heavy winter streamflow. The handicap of a low carry-over storage has been overcome. In most drainages in the southern edge of the state storage is above normal except where it has been lowered in preparation for expected heavy flows.

Montana—Over mountainous areas, the snow pack is 115 to 130% of average. In Jefferson River basin it is 50% more than in 1955 and 14% above average. Madison River surveys show 23% more than in 1955, and 115% of average. In Gallatin River basin the pack is 26% over last year's and 119% of average.

Snow pack of tributaries to the main stem of the Missouri River is 13% more than in 1955 and 107% of average. Flow of the Missouri into Fort Peck reservoir will be about 5,500,000 acre-ft, 127% of average. There is a very heavy pack in the Yellowstone River basin, 60% more than in 1955 and 137% of average. Approximately 5,100,000 acre-ft will flow past Billings from April to September. At Williston, N. D., the combined flow of the Missouri and Yellowstone Rivers will send 14,000,000 acre-ft into Garrison reservoir. In this flow, 5,500,000 acre-ft will be subject to regulation at Fort Peck on the Missouri proper.

Over the Columbia River basin in Montana, water equivalent in the snow pack is considerably greater than in 1955, 36% more on the Flathead and 42% more in the Clark Fork basin. Flow into Hungry Horse reservoir is expected to be a half-million acre-feet more than in 1955. At Cabinet Gorge, on the Idaho-Montana line, flow is forecast at 15,300,000 acre-ft, 126% of average.

There is an extremely heavy snow pack in the Kootenai River basin in northwestern Montana. It is close to the record pack in 17 years of reporting. Extremely high flows are clearly

indicated for downstream reaches of this river.

Nevada—Irrigation season supplies range from excellent along the eastern slope of the Sierras, to good along the Humboldt, and very poor in the south. Winter streamflow has been above normal in the northern and western parts. Mountain soils are well saturated. Storage in irrigation reservoirs was 60% of capacity and 97% of the April 1, 1938-52, average.

Streamflow from the east-central portion of the Sierras will range from 120 to 130% of average. Nearly normal flow will occur along the Humboldt and its tributaries in the north. In the southern part of the state, groundwater recharging from the snow pack will be deficient.

New Mexico—Drought conditions and prospective shortages continue along the Rio Grande indicate a water supply of about 25 to 40% of normal for irrigated districts. The 1956 outlook is very similar to that during 1954 and 1955. Early season snow pack, particularly on the Colorado portion of the watershed, was very encouraging. Lack of snow in March, and warm temperatures, reduced the situation to a poor rating.

Outlook on the Carlsbad and Tucumcari project is fair to good. This outlook is based on carry-over storage and fair to good soil moisture conditions rather on snow-melt season runoff. The runoff of the San Juan through New Mexico is expected to be about 75% of normal and adequate for local demands.

Oregon—Oregon's agricultural areas, including those pinched by water shortages last year, will have ample supplies. An unusually heavy snow pack and the wettest watershed soils in many years assure better than average late summer streamflow throughout the state.

Reservoired water supplies are 17% greater than average in 20 important reservoirs. Although water stored behind these dams averages 80% of capacity, many are spilling to make room for unusually heavy streamflow yet to come.

Forecasts of seasonal streamflow foretell average to well above average supplies in April through September discharge. Many streams in the Malheur, Burnt, Imnaha, Wallowa, Grande Ronde, John Day, Deschutes, Hood, Willamette, Umpqua, Rogue, Klamath, Chewaucan and Warner Lake basins will produce flows ranking in the top 10% of the highest historical records.

Some areas are planning to use "bonus" flows to build reservoir reserves for 1957. Others are cultivating marginal irrigated lands that go out of production in short water years.

Survey crew stops Sno-Cat to secure snow core from which water content is determined

Texas—The irrigated areas of west Texas along the Rio Grande will again be very short of water. Elephant Butte reservoir contains about the same amount as last year, less than 20% of normal. Total streamflow for irrigation will probably not exceed 25% of normal, about like 1955.

On the Pecos River the outlook is fair to good with 100,000 acre-ft in storage in Red Bluff reservoir as compared to 162,000 a year ago.

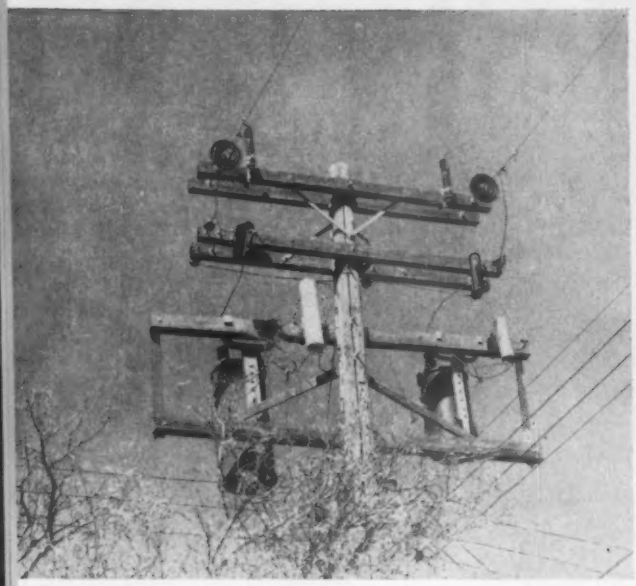
Utah—The February and March drought has largely eliminated any serious danger of damaging peak flows during spring runoff in northern Utah. Water users can look for fair to good water supplies, ranging from 70% to 120% of average. In southern Utah the recent dry weather has created a critical water shortage on most streams, particularly along Sevier River. At Kingston gaging station, April-September runoff is expected to be only one-fifth of average, slightly more than was measured in droughty 1955. Combined storage in Sevier River reservoirs is one-third less than last year and only 40% of average. Central Utah streams have fair runoff prospects. Some deficiency can be expected there in supplying water demands during the summer, but the shortage will not become critical unless the dry spring continues.

Washington — With exception of Elwha River headwaters and Olympic Peninsula, the greatest snow pack of record existed on the mountain watersheds of Washington on April 1. Several snow courses recorded new maximums a month ago. April mountain snowfall increased the pack. Extremely heavy melt season flow is expected. Forecasts of seasonal flow range from 120% of normal for Mill Creek, near Walla Walla, to 190% of normal on Ahtanum Creek, a tributary of the Yakima River. For instance, Cayuse Pass snow course, on the headwaters of the Yakima and Cowlitz Rivers, showed 329 in. of snow with 150 in. of water equivalent on March 29. This was among the many record measurements in Washington.

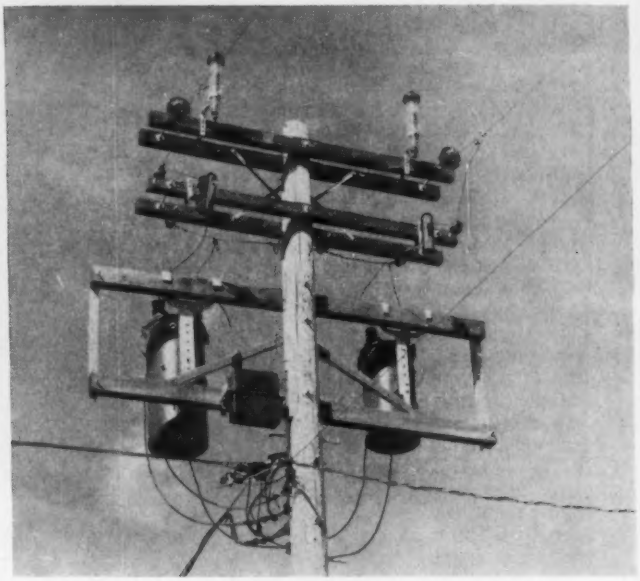
Over the state, irrigation reservoirs are filled to 56% of usable capacity and 85% of the 1938-52 normal. Franklin D. Roosevelt Lake, the major flood control reservoir on Columbia River, is at 80% of capacity and 101% of normal for April 1. Last year on April 1 this reservoir held 15% of capacity.

Wyoming—The snow pack in southern Wyoming decreased considerably during March in respect to normal, but remains 10% above the April 1 normal on the North Platte. Outlook for the North Platte and Laramie Rivers is above normal, much improved over the past two years. Water supply prospects have improved in the north and northwest mountains. Extremely heavy seasonal flows are expected for the Upper Snake River. Well above normal flows are expected for the adjacent basins of the Green River, Big Horn River and on the tributaries of the Upper Missouri River as well.

Over the state as a whole, 1,500,000 acre-ft are in reservoir storage for irrigation out of a usable capacity of 4,500,000 acre-ft. This is 70% of the average April 1 storage. Mountain soil moisture throughout the state is well above normal. Less snow water will be needed to bring the soil to field capacity. The prospects for most irrigated areas of Wyoming are good to excellent for the water year.



Series capacitors of correct size in the primary neutral of each transformer of an open wye/open delta bank eliminate voltage flicker from starting of air conditioning motors. A capacitor for each transformer is necessary to balance three-phase voltages



Voltage dips are eliminated by

Primary Series Capacitors

Arizona Public Service Co. eliminates light flicker from air conditioning motor starting by using series capacitors

R. E. Reinbold *

Supervisor of Engineering
Arizona Public Service Co.
Phoenix

A new device and method of reducing voltage regulation of the transformer secondary system is now at our disposal. It is available at a time when the accelerating use of air conditioners and heat pumps, as well as the increased use of electric energy for other purposes, is aggravating the problem of maintaining acceptable voltage regulation to customers. Both problems of light flicker and normal voltage drop in distribution transformer-secondary combinations are increasing.

The use of a small, low-voltage capacitor in series with the primary winding of a distribution transformer has promise of great value in reducing voltage drop resulting from reactive loading. Considerable study has been given by manufacturers and utilities to the application of this device, both to the technical problems involved and the economics. But it will require actual extensive field use by utilities to determine the practical value. Use of these devices in specific and special applications, particularly on three-phase systems, will now be considered.

Secondary Low Voltage

First, consider a common low-voltage condition resulting from the heavy loading of a transformer-secondary system. Two possible solutions exist: that of using the series capacitor or rebuilding the secondary. It is a matter of economics as to the choice. In some cases where thermal loading is resulting in high losses and the present physical condition has deteriorated because of age the proper solution may be to rebuild the system, but this requires time.

These low-voltage conditions will exist during the peak load season which, in the case of Arizona Public Service, is also the time when the construction forces are rushed. Also, a rebuild requires some engineering time as well as construction time. Here the series capacitor can be used as a quick, economical method of correcting the voltage complaint until the system can be rebuilt. The cost of installing the capacitor is low and, of course, it can be salvaged to be used on the next job.

Next, consider flicker voltage complaints resulting from welding equipment and motors on refrigeration equipment. X-ray equipment requires a constant voltage during the short interval of exposure. This has presented a problem in areas where there are small doctors' offices in with commercial establishments. The past solution has been to construct a separate transformer structure to supply the X-ray equipment only. This is an expensive method; therefore, a series capacitor used in the regular distribution transformer primary will reduce the

*Presented at conference of the Engineering and Operating Section, Pacific Coast Electrical Assn., San Francisco, March 22-23, 1956.

voltage fluctuations and is an economical solution.

Another similar problem is created when small welders of various types are served from the distribution system in residential areas. These welders cause a light flicker in the adjacent residences and affect television in particular. A series capacitor will correct this trouble, eliminating the expense of a separate transformer installation for the welder, as has been done in the past.

With the wide public acceptance of air conditioners and heat pumps, the problem of light flicker resulting from the starting of these motors is increasing. With the smaller size transformers used at low saturation of air conditioners, the starting current of a 3- or 5-hp motor may cause considerable voltage drop and series capacitors can be used to advantage.

On Three-Phase System

We serve air conditioning load with 240-v, three-phase service. Therefore, it is necessary to investigate the use of series capacitors on three-phase, open wye/open delta transformer banks. Application of these capacitors revealed several problems not found in single-phase installations.

The only customer's equipment that will be affected by voltage fluctuation is that connected to the lighting transformer of an open wye/open delta bank. The natural assumption is to use a series capacitor in the primary neutral of the lighter transformer only. The result is a larger reduction in starting voltage drop if the lighting transformer is on the leading phase than in the case of the same capacitor used with the same size transformer of a single-phase installation.

This difference is illustrated by the curves shown in Fig. 1, which compares the full load voltage regulation of a 25-kvar transformer and 5% capacitor used as single phase, and as the lighter of a three-phase bank for different power factor loads. The vector diagrams of Fig. 2 illustrate the condition by which the three-phase current in the lighter transformer may lag the voltage by the phase angle (Θ) plus 30°, resulting in a higher voltage rise across the capacitor. This is the same effect as if the load was of a lower power factor.

In an actual installation of a transformer-secondary combination serving a residential area with a 5-hp heat pump, the lighter transformer is a 25-kva unit and feeds cabled secondary to the heat pump. A No. 4 AA quadruplex service cable is used as the service. The calculated voltage drop in the transformer, secondary and service due to the heat pump starting is 7.89%. Use of a 5% series capacitor in the primary neutral lead of the 7.2-kv transformer reduces this starting drop to 1.75%. The drop across the power transformer phase and open phase is not reduced, but the voltage across the lighting transformer phase is reduced considerably.

Two Capacitors

The voltage chart, Fig. 3, shows the results of using two series capacitors in an open wye/open delta bank of one 25-kva and one 10-kva transformer serving a part residential, part commercial area. A small cabinet shop with one 5-hp three-phase motor and other woodworking equipment is connected to this secondary. The right part of the chart shows the voltage fluctuations resulting from starting and loading the 5-hp planer motor and also other smaller motors without transformer series capacitors. The left part of the chart shows the voltage conditions resulting with the same load and series capacitors connected in the primary neutral lead of each transformer. It will be noted that the volt-

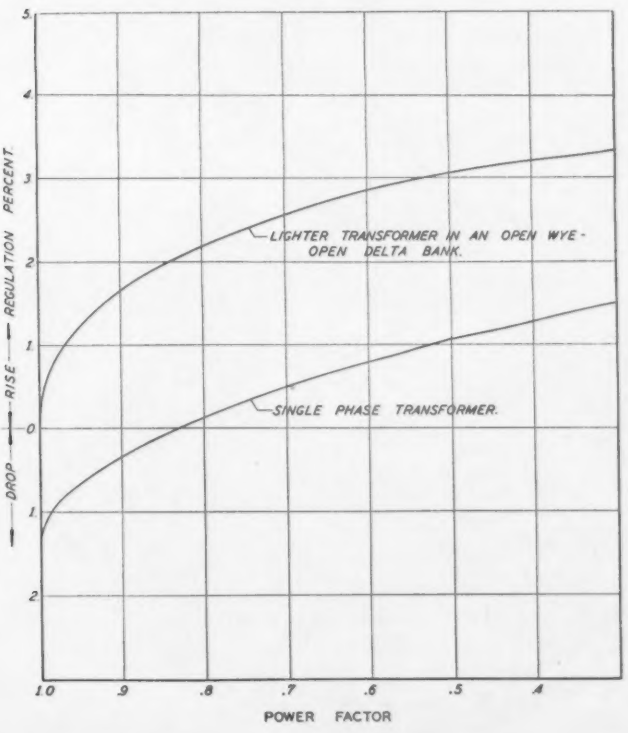


Fig. 1—(left) Voltage regulation obtained from transformer-capacitor combination using 5% series capacitor on a 25-kva transformer with 100% load.

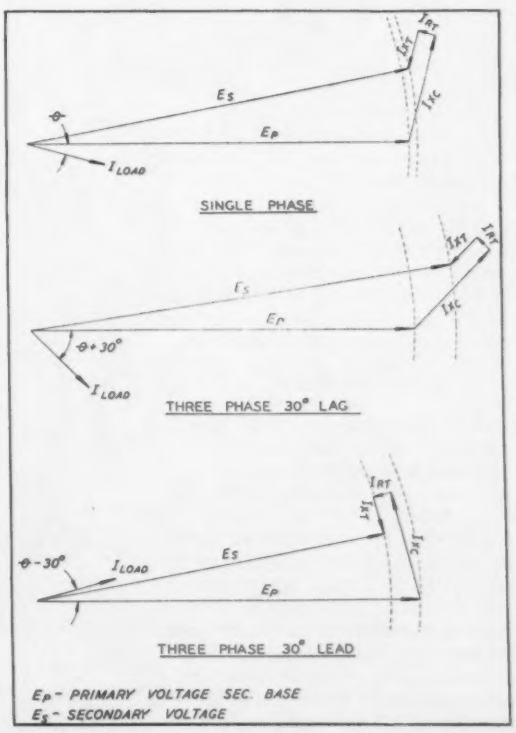
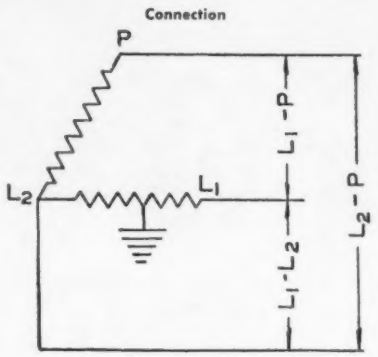


Fig. 2—Single- and three-phase voltage vectors from transformer-series-capacitor combination

Table I—Three-Phase Unbalanced Voltage and N/P Ratios

Phase	Capacitor on Lighter Voltage	Capacitor on Lighter N/P Ratio	Capacitor on Both Trans. Voltage	Capacitor on Both Trans. N/P Ratio
1. Load condition—one 5 hp 3φ motor and 25% 1φ load				
$L_1 - L_2$	241.1		241.0	
$L_2 - P$	237.1	.015	238.2	.009
$L_1 - P$	235.0		241.8	
2. Load condition—100% load on both transformers				
$L_1 - L_2$	241.8		241.8	
$L_2 - P$	235.0	.032	237.1	.0115
$L_1 - P$	232.3		240.2	
3. Load condition—140% load on both transformers				
$L_1 - L_2$	242.5		242.5	
$L_2 - P$	232.4	.046	236.0	.016
$L_1 - P$	223.0		240.3	

Connection



age dips shown at approximately 1:50 p.m. are very small compared to the dips at 3:30 p.m. to 3:45 p.m. when the 5-hp motor was started.

Three-Phase Unbalanced Voltage

Since a small unbalanced three-phase voltage may have a serious effect on three-phase motors and may cause overheating, it is necessary to investigate voltage unbalance resulting from the use of series capacitors.

A basis must be had for determining the degree of voltage unbalance. The most acceptable definition is the ratio of negative sequence voltages to positive sequence voltages. By knowing the phase-to-phase voltages, a charge may be used to determine the N/P ratio. If we accept the present limit of N/P ratio as 0.025, then we have a reference point to determine if any set of three-phase voltages will be within acceptable limits.

Unbalanced voltages during the starting of a motor will not cause any trouble, but it is very important under running conditions. Serious unbalanced voltages do not result in the case of the heat pump example, as these tests were taken during the light load season.

N/P Ratios

The accompanying table shows a complete study of the unbalanced voltages and N/P ratios at different loads, with one series capacitor in the lighting transformer only and with a series capacitor in both transformer circuits. It will be noted that at light load conditions the N/P ratio is not exceeded with only one capacitor; but, when the load approaches 100% of the transformer capacity, the unbalance limit is exceeded. The use of a capacitor of proper size in the neutral of the power transformer solves the problem. It will be noted that, with a capacitor in each transformer primary, the transformer can be loaded to 140% without approaching the N/P ratio limit. The conclusion is that it is absolutely necessary to use a capacitor in each transformer primary neutral lead for the purpose of voltage regulation.

Conclusions

It may be seen from the above examples that the distribution transformer primary series capacitor may solve many nuisance-type voltage complaints. The economics of each case may determine the final method of solution but the series capacitor has its place.

Although most of the analyses and studies have been directed at single-phase use, the capacitors may also be applied to three-phase systems with excellent results. The final extent to which these capacitors will be used depends on further study and actual field operating experience on the utility systems. Arizona Public Service Co. will continue to use them and believes they will become an accepted part of the transformer-secondary system.

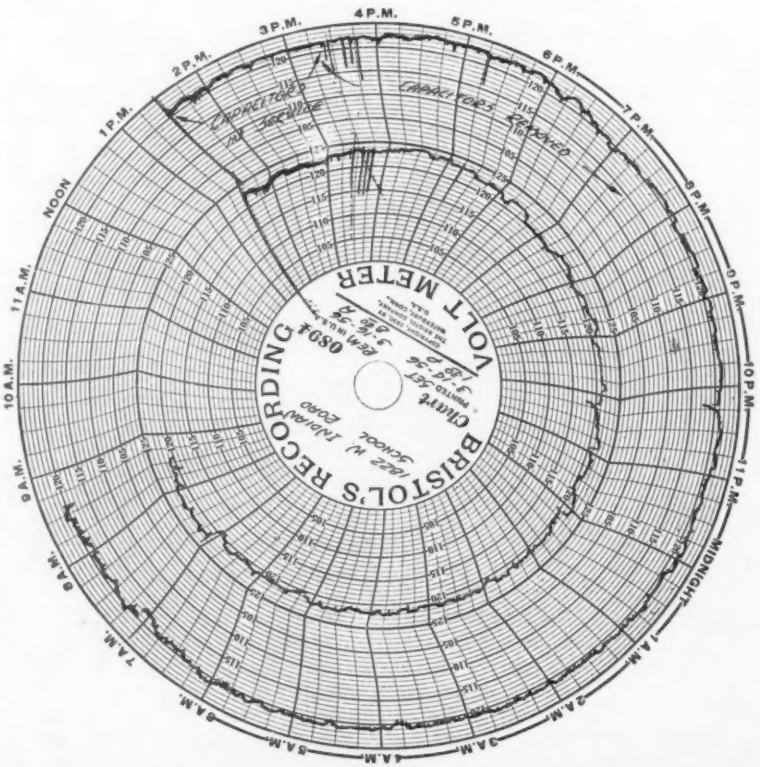


Fig. 3—Customer's voltage chart with and without series capacitor in transformer primary neutral showing that with capacitor in motor starting voltage dips are negligible

ELECTRICAL WEST SALES GUIDE © MAY 1956

News Letter

FOR THE ELECTRICAL MERCHANT OF THE WEST

Plans to take home

Priced from $2,500 to $9,000 including appliances and cabinet work, four model kitchens were displayed by Westinghouse at the American Institute of Decorators' show in the San Francisco Civic Auditorium last month. Adaptable for new or remodeled homes, plans were available to anyone who wanted them. Designer Melanie Kahane, who attended the showing, took into consideration such potential troublemakers in existing homes as an awkward corner. She also used color skillfully, combining and contrasting, so that "sterile color" would not replace "sterile white." A feature of the de luxe kitchen (sold before the show ended) was an automatic appliance center, permitting use of five electric housewares at one time.

"Dialed" light

Among those showing home lighting at the San Francisco Decorators' show was Superior Electric Co., which brought along a trailer to show a house in miniature, with controlled lighting in every room. A second display also featured the dimming device; allowed visitors to operate the control themselves. Being tried out to gage interest was a device for remote control of a table or small floor lamp.

Show draws

Some 30,000 attended the home show sponsored by AMA at Phoenix with Arizona Building Contractors and Phoenix Home Builders Assn. Although the event was the sixth annual AMA Appliance Fair, it was the first joint show.

Summer Mart

Freezers will get a big play during the Western Summer Market at San Francisco (July 16-20), advance reports promise. Many firms will be showing new freezer models for the first time and many will be styled up to go with remodeled kitchens. Some are expected to have the built-in look and many will come in a range of colors.

Radio Week

West Coast activities for National Radio Week, May 13-19, were being handled by William Herrman, Hoffman Electronics Corp., and announced plans included exploitations with the "Hollywood Touch." California's celebration had the cooperation of California's Governor Goodwin Knight and Los Angeles' Mayor Norris Poulson.

O. H. I. explained

An all-electric model home, the Signature, is being built on the Pan Pacific grounds at Los Angeles for exhibition during the Home Show, June 14-24. Those cooperating in the show are determined to dispel the mystery about "Operation Home Improvement," have designed a "giant" program to explain its rewards.

Two barrels

A double-barreled electric range promotion—designed to build dealer store traffic—is being sponsored by Portland General Electric Co. through May. Barrel 1—Operation Trade-in—offers cash allowances up to $35, which are paid through dealers for old ranges. Barrel 2—Wifesaver Electric Range Contest—offers a $3,000 all-electric kitchen as grand prize and 24 de luxe ranges as weekly prizes for completing the statement, "Eight out of ten of my neighbors use and prefer an electric range because . . ." Each entry must be validated by a dealer. Thus the contest pulls customers in and the trade-in allowance helps sell them. And to get selling action there are prizes for dealer salesmen too. The cash allowance works as follows: $15 is allowed on all types of ranges turned in by PGE customers on purchase of a new electric range; $10 in addition is given if at the same time and address a Schedule 8 customer becomes eligible for billing under the company's all-electric rate; $10 more if the trade-in range is delivered to PGE. Results will be told in a later story.

Big job . . .

Getting 29,508 entries to a clothes dryer contest would seem like a tremendous task to undertake, and that number represents just twice as many as the Rocky Mountain Electrical League and the *Denver Post* were really expecting to receive. Yet, in a contest that required entrants to clip out a newspaper coupon and take it to a dealer for certification, nearly 30,000 people in Colorado, Wyoming and nearby states entered the contest to win one of the 20 dryers put up as prizes. Two years ago, in a dryer contest without the dealer certification requirement, 76,000 entries were received. The big force behind the successful contests has been the *Denver Post,* which carried a nine-page special section on dryers and daily stories about the contest. A coupon with the daily story required entrants to tell in 25 words or less what a dryer in their home would mean to them. Then they took the coupon to a dealer for certification, thus getting a look at his products and revealing an interest in a dryer. Dryers used as prizes were donated by distributors. Contest entries were judged by a panel selected by the *Denver Post.* The contest two years ago hiked dryer sales 300% over 1953, and another survey will be made to learn the effect on the 1956 contest. The 1954 contest lasted three weeks, the 1956 carried on four weeks.

Big promotion . . .

Big results

More allowances

Seattle City Light has expanded a program under which it makes cash allowances for electrical appliances added to its lines. It now offers $10 to every customer who installs a 240-v clothes dryer and has not previously used one. It will continue to pay $40 toward an electric range replacing flame-type equipment and $25 on an automatic electric water heater, 50 gal or larger, that replaces a flame-type or outmoded electric unit. The range and water heater offer is for moderization of existing homes only but the dryer allowance applies to new homes as well. Eighty-three electric ranges were added to the utility's lines during the week ended March 26 to make the score 174,079 ranges; 250,479 meters.

Fourth annual

Sacramento MUD's "I want an Electric Range" contest will continue through May. A feature has been added to this contest, conducted for the past three years. There will be cash prizes for salesmen. As previously, 13 electric ranges will be awarded for the best statements in 24 words or less on the contest theme. It is recalled that the award has been won at least once by a man.

Results

A survey conducted by B. C. Electric shows that during 1955 54,957 TV sets were sold on the mainland and 9,612 on Vancouver Island. Other heavy sellers were electric ranges, 12,036; radios, 13,590; cleaners, 13,563.

Shows draw

Shows are attracting crowds in Idaho—At Emmett, 98 women attended a two-hour Spring Freezer School on April 13. An earlier Easter Cookery Party at Payette also drew them in. Five dealers cooperated with power company personnel in the Emmett show. Door prizes were fry pans—five of them.

Home trial works

A free home trial is the answer to selling electric dishwashers in volume, El Paso Electric Co. believes. In fact it put the plan in operation this year and during the first four months sold more dishwashers than it did during all of 1955, F. C. Quinn, director of dealer relations, reports.

Expanding

Reddy's Kollege of Kitchen Knowledge, inaugurated by El Paso Electric when it opened its demonstration kitchen last year, is expanding its curriculum to include group demonstration in food freezing, laundry techniques, kitchen planning and other home tasks. Classes in light conditioning for the home are in the planning stage. The range demonstrations, which are being continued, have attracted more than 2,000 women so far.

Freezer drive

New Mexico Electric Service Co. is featuring freezers in its May advertising, tying in with the theme, "Freezer Living Is Leisure Living." Freezer sales on the system totaled 83 on April 15. On the same date the record was: 35 ranges, 157 refrigerators; 12 dishwashers; 25 dryers; 196 automatic washers; 28 conventional washers; 3 ironers; 577 TV sets.

Will sell to discounters

Sues, Young & Brown, staunch advocate of fair trade, has liberalized its policy to permit sales to discount houses, if certain conditions are met. Charles Culbert, SYB vice-president, was quoted in an industry paper as saying the decision was made in a desire to gain "our share or better" of the southern California market. Products previously declared under fair trade will continue in this category, even while being sold by discount firms, and discount merchants are expected to sign dealer authorization agreements prior to taking on SYB lines, it was reported.

With the exception of ironers and air conditioners, electric appliance sales were up last year on the Pacific Power & Light Co. system, according to comparative 1954 and 1955 figures released recently. Electric clothes dryers were up about 46%; automatic clothes washers were nearly 30% greater though conventional washers were up only about 2%. Other gains: ranges, 14%; water heaters, 7%; waste disposals, 24%; dishwashers, 22%; refrigerators, 16%; home freezers, less than 4%.

Sales up

Oregon's Fair Trade Act of 1953 was declared unconstitutional as it applies to nonsigners in a decision handed down by the state supreme court. The opinion, given in General Electric's suit against R. H. Wahle Co., upheld a circuit court judgment.

Decide against Fair Trade

In an effort to eliminate cut-rate shops and "sundowners," representatives of four Bay area TV service associations voted to support IBEW Local 203 in a drive to unionize service shops in eight northern California counties. Hours, minimum prices will be set; price advertising will be dropped by shops that sign.

Try for union shops

Merger of Borg-Warner and York Corp. has been approved by directors of the two companies. Distribution organizations will not be affected, it was announced, and independent manufacturing and marketing operations will be conducted.

Merger approved

Cleanest, or most in need of cleaning, whichever the case may be, Californians purchased 12% of all automatic home washers sold in the nation during 1955, and 10% of total automatic, wringer and spinner types. They led the nation.

Lead nation

Philco entered the home laundry equipment field April 27 with a meeting in Philadelphia for eastern distributors. Other meetings will be held in Atlanta, Ga.; Chicago and San Francisco. National distribution of the equipment starts May 15.

Enters field

California Electric Service Inc. has opened its seventh branch at 5761 Van Nuys Blvd., Van Nuys, Calif. Larry Chappell will head the branch location for service and parts for electric appliance dealers.

Seventh branch

First signs of the Magnavox expansion in the West came with the appointment of Dale Kelly and J. C. Nash as Spartan district managers for northern and southern California, respectively, and Richard Rochek to head up a new territory in Oregon. New regional manager in San Francisco is John M. Barker. The company is building a new warehouse and service building in Los Angeles and acquired a warehouse in Seattle.

Expands

Cooperation in the "Housepower" program is reported by most Western utilities. In connection with this promotion a $100,000 program, running May 1-Sept. 30, offers a $10,000 cash top prize and more than 1,000 electric appliances to users of electricity. To enter, the contestant must check answers to a series of questions; complete the statement, "It's smart to invest in full Housepower because . . . "

Housepower contest

More than 300 meetings have been held by Western utilities to encourage Live Better . . . Electrically participation by industrial allies, such as builders and bankers. PCEA used LBE as its conference theme, Pacific Gas and Electric Co. is using "Meet Mrs. Swenson" in a series of 75 LBE schools, Cowlitz County PUD has spread glowing bumper stickers over the business section of Longview, Wash., and the LBE emblem is a regular part of most utility advertising. Many other variations are being used, too.

LBE takes hold

Names in sales news include Harold D. Conklin, formerly with Hotpoint and Admiral, who is now in the distributing business with Conklin-Tamberg Inc., San Francisco . . . Leonard M. Murchison has been appointed West Coast sales manager for CBS-Hytron equipment. He will be at Los Angeles . . . Miss Fran Osborne is new regional home service director for Norge appliances in an area that includes El Paso, Albuquerque, Silver City and Denver, among others . . . Howard N. Walters, general sales manager for British Columbia Electric, has announced his retirement. He will be succeeded by Dr. Otto Zwanzig . . . Dave VanWinkle has the new position of sales promotion manager for Hoffman Electronics Corp., Radio Division, in a re-alignment of the advertising department . . . Leonard Smith has been named marketing manager of Hotpoint Co.

People in the news

Regretfully reported is the death of R. D. Swain, sales manager of Major Appliances & Refrigeration Ltd., Frigidaire representative at Vancouver, B. C.

Mourned

Air conditioning looms as a strong competitor for consumer dollars as summer sets in and companies offer a variety of models and price ranges of equipment. Mitchell Mfg. Co. has seven new models or lines this year from window casement models to five-ton commercial units. York Corp. has two room air conditioners featuring simple operation and power savings and Carrier Corp. announces two new lines of "fan coil" units with remote sources of refrigeration and heat. Airtemp Division, Chrysler Corp., announces production of a new two-ton waterless central home air conditioning system that will cost "less than $750 installed." Frigidaire has a new 1½-hp room unit and a 1-hp reverse cycle heat pump in its 1956 line. Also available is a detailed year-round air conditioning manual for builders.

Coolers compete

Plans were announced to show G-E's electronic oven at state and county fairs in the West. Meanwhile attempts were being made to get an FCC decision on use of the 890-940-mc band, originally assigned for industrial, scientific and medical devices but now being used for radio microwave stations. The G-E model and some others operate on the 915 band. Some of the ovens being developed are for the 2,450 band, also allotted to such devices.

To show oven

Snooz-Alarm is the name of a new feature of G-E's Telechron clocks. As the name suggests, it arouses the sleeper 15 minutes early to create the illusion of a bit of luxury rest before the final alarm sounds so the sleeper can begin oversleeping in earnest.

Stolen sack time

Convertible features of Du Mont Telesets include removable legs and end tables that match the set and the table it is on . . . Apex is going to introduce a new combination washer-dryer with vertical tumbler action this year.

Corner fitter

Just as the aeronautical people are measuring efforts by the sound barrier, the television industry is trying to bring the price of color TV to below the $500 barrier. RCA has cut the price of its 21-in. color tube to $85 from $100 to manufacturers ordering in bulk packaging. A Chicago dealer was able to offer 500 sets for sale for $495 by arrangement with CBS, the manufacturer, who absorbed part of the cut from $895.

Pocketbook appeal

Speaking of price cuts, G-E has lowered the price of transistors for the third time in 14 months. Latest reduction is on five high-frequency types and amounts to 22 to 53%.

Better production

Magnetic recording of television programs on tape will be underway by CBS-TV soon, on three recorders designed and manufactured by Ampex Corp., Redwood City, Calif. Programs can be recorded directly from the camera, from a TV receiver, from TV transmission lines or microwave relay stations. Ampex engineers are now working on a recorder that will handle color.

Tape records of pictures

Sun-powered radios and personal television receivers weighing only 16½ lb. are available commercially from Admiral Corp. now. The radio is an all-transistor model with a 32-cell silicon sun power pack as optional equipment. The TV set is aluminum; has a 10-in. picture.

Sun power

While it seems like a sizable amount of money for a coffeemaker, $50,000 is an easily remembered sum, and a gold-plated, ruby and diamond trimmed coffeemaker will make an impression, too. It's possible Westerners may get to see the coffeemaker, because it was made to acknowledge manufacture of the 15,000,000th Universal coffeemaker, and will be on display at various locations during the year. Landers, Frary & Clark, Universal manufacturer, celebrates its 114th anniversary this year.

Anniversary unit

Newest on the scene in the manufacture of automatic dishwashers is Given Mfg. Co., maker of the famous Waste King Pulverator. The new Waste King dishwasher is publicized as having 53 special features, not the least of which is the ability to circulate water at the rate of 60 gpm in a fine jet spray.

Adds dishwasher

Installation simplicity and a shallow construction are highlighted features of a new four-unit electric cooking top announced by Tennessee Stove Works, Chattanooga. Available in either stainless steel or coppertone porcelain, the range also has a set-on griddle for use on one unit.

Cooking top

Commuters will probably like Raytheon Mfg. Co.'s new transistor pocket radio. It has a plug-in earphone attachment, much like a hearing aid, that allows listening without disturbing the folks nearby.

Pocket radio

Ernest D. Schettler, IEA president, Mrs. Schettler and Harry Price, NARDA president

Industry problems faced when IEA

Meets at Salt Lake

How to build a sales personality was told by Harry B. Price Jr., Norfolk, Va., dealer and NARDA president, at the annual conference of the Intermountain Electrical Assn. in Salt Lake City, March 16. More than 200 industry members and their wives attended the banquet session which he addressed.

With a business that has reached $4,200,000 annual volume as compared with a half-million for his closest competitor, Price is a strong advocate of door-to-door selling of nationally known brands. He advises close allegiance between dealers and their brands.

His own chain of retail stores is a proving ground for his theories on selling incentives and the mass movement of merchandise at list prices.

Speaking at the afternoon session, Howard W. Price, vice-president and general manager of Salt Lake Hardware Co., discussed the pressure on distribution.

Pointing to the changes in distribution in the appliance field and the competitive factors that have both confused and reduced net profits of wholesalers and retailers, Howard Price cited the Fair Trade law as a typical example.

In Utah, he said, the fair trading of merchandise has been transformed in a period of ten years from an almost ideal situation, with one of the most highly effective Fair Trade Administrative Divisions, to a deteriorated, confused and still unsettled legal question. The case to determine whether the Fair Trade law is constitutional in Utah has been before the State Supreme Court for more than 14 months, he pointed out.

While the Fair Trade laws have been under fire and not receiving the best possible support from distribution, the discounter has come into being, he continued. While the final answer to this discounter problem is a moot question, the price cutters and the national catalog houses will continue to be tough competition, he believes, because they will continue to receive illegal price concessions from their sources. Some of the smaller discounters are sold by wholesalers openly, he said, but in other cases legitimate retailers, "who step over dollars to pick up dimes," have permitted themselves to be used as brokers.

Many leading manufacturers have taken steps to correct the situation, he said, and shorter margins are one approach. The cost of distribution has declined slightly, in spite of rising costs, but net profits have been on the decline, he commented. During the same time profits of most manufacturers have been improved or maintained, he said. "If the manufacturers believe in the philosophy that they are trying to sell others, then why don't they share and share alike in price reduction?" he asked.

Both phases of distribution should carefully analyze and reappraise their own values and should not become timid or captive but confident and proud of their functions and the excellent job they are capable of doing, he declared. They should look around and put a pencil to their investments in fixed assets, facilities, in man power; should evaluate the service they render, the years of experience and know how they possess. They should have the moral courage to speak out, to insist that some of the practices and pressures that cost them gross profit be corrected.

There are many ways by which distribution can improve its profits. One is "to work with and for people that you believe in and who have your best interest at heart—work with and promote the sale of products of a manufacturer as well as a wholesaler who keeps the line clean and in the proper trade channels," he said.

Others on the afternoon program were De Lamar Holt, Utah Power & Light Co., who discussed the Live Better *Electrically* program and Glen Shaw, vice-president of KDYL, who showed a strip film on advertising. *Man of Action,* the color film produced by American Council to Improve Our Neighborhoods, was shown also.

One of the highlights of the conference was the presentation by IEA President Schettler of a $100 bill to Tooele Mercantile Co., grand prize winner in the area-wide Electric Window Display contest conducted in connection with the February dryer promotion. Quota of 2,000 dryer sales was exceeded during the campaign.

A friendship hour sponsored by electrical distributors preceded the banquet. The ladies were entertained with an afternoon fashion show at the Makoff store. Music for the conference was provided by the Utah Power & Light Co. quartet, Darcie White, Harry Shewell, Harold Nicholsen and William Clark, and by Earl Donaldson, organist. Rolfe Peterson, KSL, was master of ceremonies for the banquet.

The general conference committee was headed by Tom Anderson and included President Schettler, Modern Electric; Lennox Murdock, KSL, program chairman; G. Bennett Larson, KDYL-KTVT, publicity and banquet. Leo Hansen, Westinghouse, was chairman of the friendship hour committee; Joe M. Hansen Jr., Westinghouse Supply, was in charge of attendance and registration; Mrs. George Coray of ladies entertainment.

Cooperative program promotes

Range Modernization

Some 300,000 housewives were told that old electric ranges can be modernized and more than 600 asked for further details in a cooperative promotional program sponsored by the Northern California Electrical Bureau. Set up at the suggestion of two distributors handling universal-type surface units, the campaign was supported by Pacific Gas and Electric Co., by dealers and others in the industry.

With its February bills to all-electric service areas, PG and E sent a colorful insert entitled "Modernize Your Electric Range." This insert bore a coupon to be mailed to the Northern California Electrical Bureau by customers who wanted additional information.

By the end of February, the bureau had received 390 requests for the additional information, by April 23 it had 648 returned coupons and presumably more would come in. Thus one-third of the response to date has come in after the actual campaign was over.

Processing of the requests was described by Bert W. Reynolds, bureau manager. The bureau sent the names of interested housewives to the distributors, who in turn passed them on to their dealers in the areas represented. PG and E also received the names of interested customers and its district office personnel were informed.

The two distributors who had seen the value of such a promotion and independently suggested it—Montgomery Bros., Western representative for Edwin L. Wiegand Co., and Lavenson & Savasta, Tuttle & Kift distributor—expressed satisfaction with results.

Jay Berggren of Montgomery Bros. reported in detail on his company's follow-up of bureau leads. This representative mailed information on Chromalox units directly to the interested housewife and gave her the name of the nearest dealer who could supply them. The dealer was also notified.

To insure adequate and thorough servicing facilities which it considers the key to success of such a program, Montgomery Bros., working with their distributors, established stocking dealers in all areas covered by the promotion. Effective use was made of the new MicroChest display unit, which simulates an electric range; has a top that holds two surface units and promotional literature.

Commenting on the activity, Berggren said that the cooperation of the various participants in a promotion that benefited customers and brought sales opportunities is a "typical example of the organization required in a successful promotional campaign."

C. J. Savasta of Lavenson & Savasta said in a letter to the bureau that the activity had stirred up enthusiasm and also increased sales. Dealers had reported favorably, he said. In referring inquiries to them, his organization had pointed to the opportunity to modernize an old range with T&K units and possibilities of a lead-in to future appliance sales.

AT INSTALLATION of new officers of the Los Angeles Electric League, Past President Elwood Reeves, Magnavox division manager, hands the gavel to the 1956 president, Ray King of Ray King's Appliance Center. Glen L. Logan, ELLA managing director, looks on. More than 250 attended the dinner meeting, the association's tenth annual

Colorama

A 60-hour Colorama Sellathon recently netted a record for Butler Bros. in Seattle. Ten per cent of the more than 200 units sold were in color and several entire kitchens were being planned as a result of the activity.

Regular store hours were maintained during the Sellathon instead of the round - the - clock program sometimes featured in this type of sale. The store was open two evenings.

Crowds were attracted by a continuous round of entertainment. Stunts were broadcast every 15 minutes from the store and prizes were offered. Qualification was simple but the prize went to the first person who met the requirements.

Half of the store display was in color. Advertising stressed the point that carloads of colored appliances had been purchased and white units must be sold to make room for them.

L. A. Mart

Work started last month on the Los Angeles Furniture Mart, which had been in the planning stage for more than 10 years. The $7 million building is going up on a 4½-acre site bounded by Broadway, Washington and Hill.

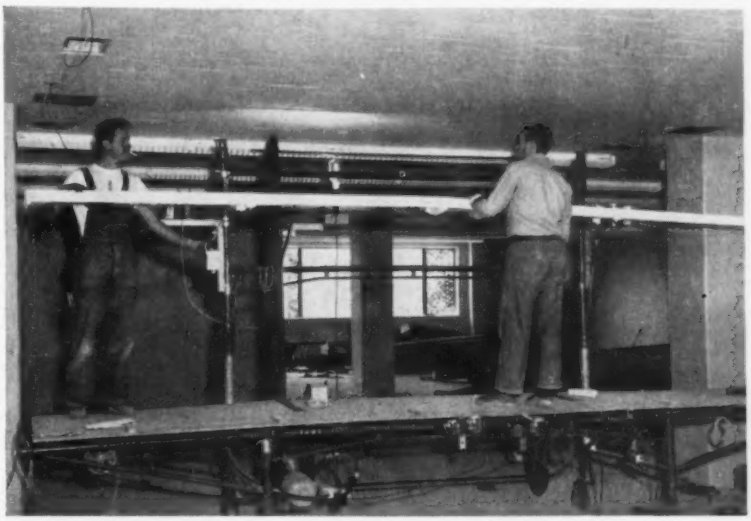
The building will have 12 stories with more than 800,000 sq ft of floor space. In addition to show rooms, there will be meeting rooms, a restaurant, service facilities, space for a bank and drug store.

For 22 years the Los Angeles Mart has been at 2155 East Seventh St. A. V. MacDonald is executive director.

Mechanized Installation

Contractor uses production line method to install 18 miles of lighting fixtures

Eleven acres of lighting in the California Employment building in Sacramento . . .



. . . were installed efficiently by using this motorized fixture assembly bench and lifting rig handling 16-ft fixtures. It was designed by Collins Electric, contractor

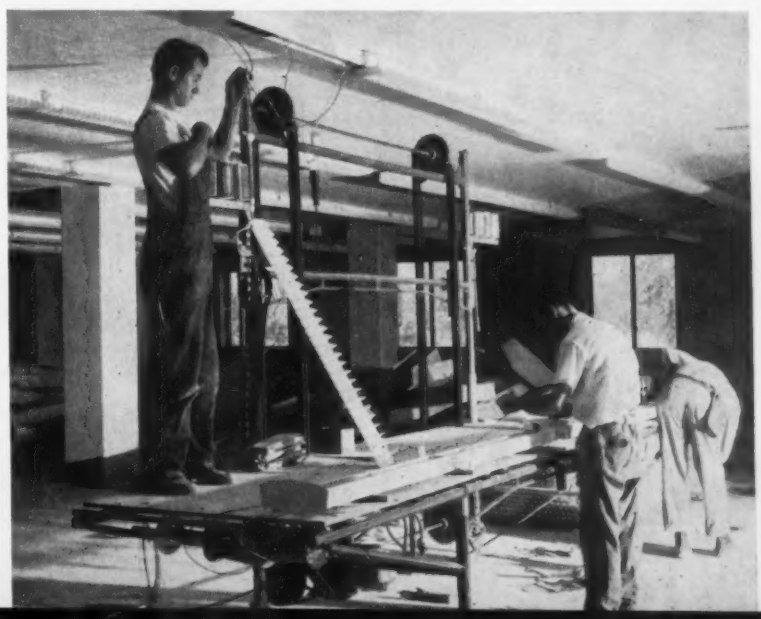
While such features as automatic elevators and a 480/277-v system for distribution in California's largest office building are of interest, the method of installing the 8,862 Westinghouse 8-ft slimline lighting fixtures, 18 miles of fixtures, in the 493,000 sq ft is most significant.

An ingenious ¼-hp gear motor operated fixture lift mounted on tubular scaffolding on castors provided both an assembly table and lift to expedite the fixture installation. The device was designed and made by John Nomellini, vice-president of Collins Electric Co., Stockton, electrical contractor for the California State Department of Employment building in Sacramento. A three-man crew followed a routine set up by Ed Shirley, foreman. One man unpacked and assembled the fixtures on the bench. The second helped complete the assembly, then joined the third man on the rig. The motorized chain-driven lift carried the 16 ft of fixture safely to the ceiling, holding it in position to be bolted to the studs from a Kindorf hanger above the plastered ceiling. Connections were made and louvers mounted. Then the rig was moved to the next bay for the next operation. Outlets on the rig supplied electric drills and nut runners. All fittings, tools and wire reels needed were carried on the rig.

The lighting was designed by State Engineers Stuart Davies and Menno Harder to give 75 f-c at desk level. Distribution system is 480/277 v and fixture ballasts are 277 v, designed for use with standard 120-v lamps. All switching is Bryant low-voltage control with relays in the outlet boxes.

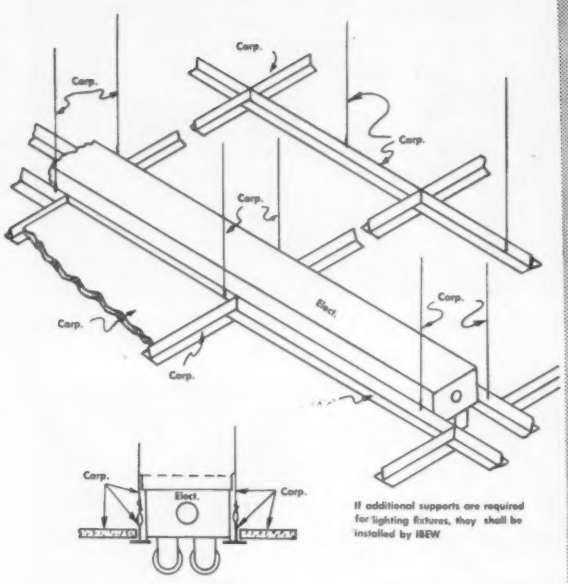
Main switchboard is 5,000 amp capacity, metal-clad drawout type. Panelboards, transformers and main switchboard were built at Westinghouse Sunnyvale plant.

In the picture above are A. J. Sanguinetti, president, Collins Electric; Dane Egbert and Paul Hamre, Wesco; Glen Lively and Ed Shirley of Collins; M. J. Verseman, Wesco, Sacramento; and E. L. Bryant, Sacramento manager of Collins.



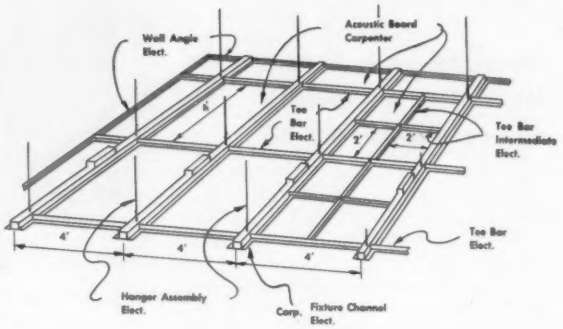
SUSPENSION SYSTEMS

Fixtures Supported by Tees

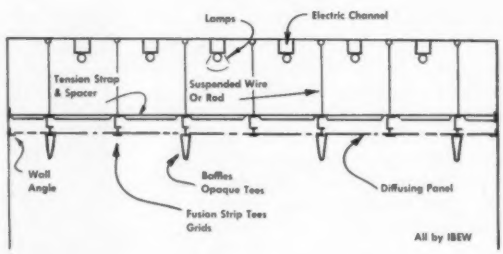


If additional supports are required for lighting fixtures, they shall be installed by IBEW

Fixtures With Acoustical Lay In

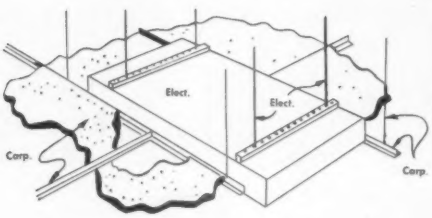


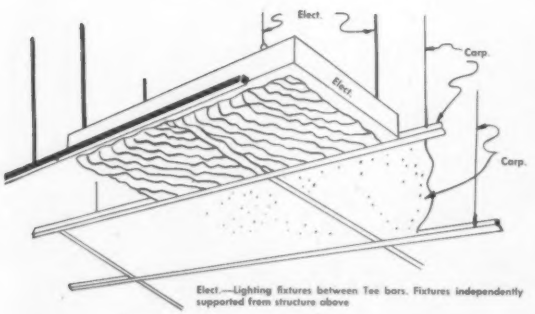
Wall-to-Wall Luminous Area Independent Suspensions



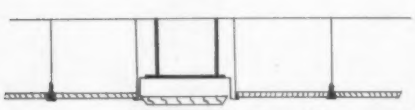
All by IBEW

Fixtures Independently Supported



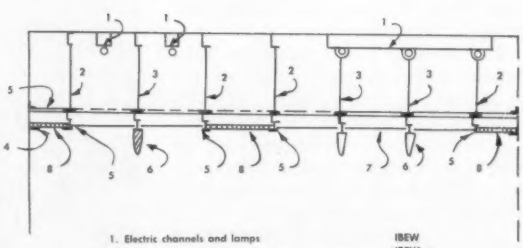


Elect.—Lighting fixtures between Tee bars. Fixtures independently supported from structure above



Carp.—Tee-bar grid system suspended from structure above and all acoustic tile

Partial Coverage Integrated or Independent Systems



1. Electric channels and lamps	IBEW
2. Common hangers to be assigned with tees alternate	IBEW or Carpenters
3. Luminous panel hangers	IBEW
4. Wall angles*	Carpenters
5. Common tees (alt. electrician bracketed par. 4)	
a. Designed to match and tie in with acoustical	Carpenters
b. Designed to match and tie in with plastic	IBEW
6. Baffles and /or fusion strip tees or opaque tees	IBEW
7. Diffusing panels	IBEW
8. Acoustical tile	Carpenters
9. Tension strap spacer	IBEW

* Note—Where wall angle is common to acoustical tile and luminous panel bracket portion of par. 4 applies. Alternate electrician or carpenters.

Jurisdictions decided for

Luminous Ceilings—Who does What

Settlement of jurisdiction for the installation of suspended luminous and acoustical ceiling elements was made in an agreement between the International Brotherhood of Electrical Workers and the United Brotherhood of Carpenters and Joiners of America. That agreement in full is reproduced in the accompanying box. With the agreement a series of 15 drawings were included. Of the 15 there are eight reproduced here. They illustrate practically all of the details essential to a clear understanding of who is to install each part of a combination system where the two crafts are involved.

With the release of this agreement the following explanation of it was made by the District 9 office of IBEW:

1. Some differences of opinion as to who should install different elements of suspended luminous and acoustical ceilings have arisen in the past and a joint committee of the two unions have met during the past year to arrive at an agreement on this subject.

2. Differences arose largely due to new elements in construction and new methods of installation.

3. The prompt meeting and solution of these problems by the two unions was carried out to eliminate difficulties in specifying these new methods and facilitate the proper use of these new materials.

4. This agreement provides that typical suspended acoustical ceilings shall be installed by carpenters and where fixtures are added to these traditional grid supported ceilings they shall be installed by electricians. All additional supports required for lighting fixtures shall be installed by electricians as well as all grids supporting lighting fixtures only.

5. The new integrated systems where the fixture becomes part of the grid system are divided so that the electricians shall install all of the hangers, grid systems and fixtures and the carpenters shall install acoustical materials in the grids.

6. In luminous ceilings the light diffuser and grid system supporting the light diffuser as well as the hangers for this system are installed by the electricians. Carpenters will install the acoustical tile and grid system bordering a luminous diffusing system.

7. A clause is added qualifying the entire agreement to the effect that the basic design and practical procedure of installation determines which trade installs any common hangers and supporting members holding both light diffusers, fixtures and acoustical material.

8. The agreement is effective Feb. 1, 1956, and was signed by the International presidents of the two organizations.

9. A series of 15 drawings were

AGREEMENT

Agreement entered into by and between the International Brotherhood of Electrical Workers and the United Brotherhood of Carpenters and Joiners of America.

The object of this agreement is to prevent jurisdictional disputes between the parties hereto with respect to the installation and erection of luminous and acoustical suspended ceilings.

To achieve this object, the parties hereto agree as follows:

1. The installation of typical suspended acoustical ceilings shall be the work of members of the United Brotherhood of Carpenters and Joiners of America.

2. When electric fixtures are used, such as All-Brite (Arealiter) or Day-Brite (Mobilax), or other types of fixtures which fit into a grid system: the grid systems supporting acoustical tile and electrical fixtures shall be installed by carpenters providing parallel tees at two sides of light fixtures support acoustical tile. If additional supports are required for lighting fixtures, they shall be installed by electricians. Electricians shall install all tees and hangers which support lighting fixtures only. The electricians shall mechanically secure and ground the fixtures.

3. When the electric fixture is suspended from the ceiling which in turn forms part of the grid system; examples, Taylor Ceilings, United Lighting and Ceilings Co., and Drive Lok (with electrical raceway built in), electricians shall install all supporting hangers, install electric fixtures, cross members and wall angle. Carpenters shall install all the acoustical materials therein.

4. Where the electrical fixture is fastened to the basic ceiling and the light diffuser is suspended on a grid system, electricians shall install the electric fixtures, the grid system, the diffusing panels, hangers and wall angles necessary to hold the diffusing panels and grid in place. Where acoustical borders and/or fields are used, carpenters shall install the acoustical tile and such wall angles and/or hangers as are necessary to support the acoustical border or field. Examples: (Wakefield, Benjamin, Sylvania, Acusti-Luminous Ceilings, Smithcraft Lighting Division and Daylight Luminous Ceilings.)

It is the intention of the parties to this agreement to allow the basic design and practical procedure of installation to determine which trade installs the common hanger and supporting member holding the light diffuser or fixture and acoustical material.

This agreement shall take effect on Feb. 1, 1956, and shall remain in full force for two years.

Unless notice of a desire to change or modify this agreement is served by one party on the other 60 days prior to its termination date, it shall automatically continue in effect for another period of two years.

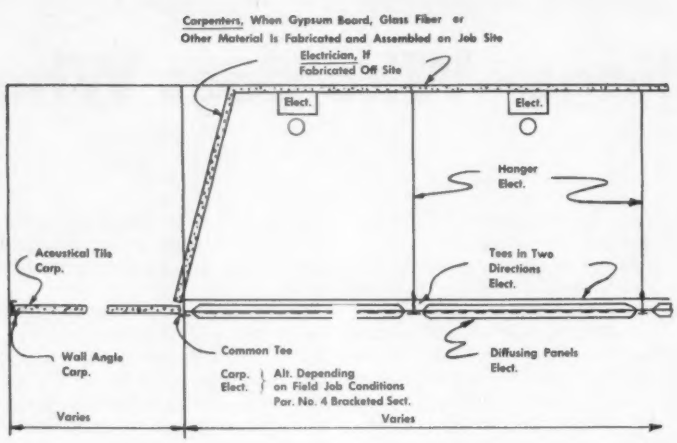
United Brotherhood of Carpenters and Joiners of America	International Brotherhood of Electrical Workers
Maurice Hutcheson General President	Gordon Freeman International President

Joint Committee

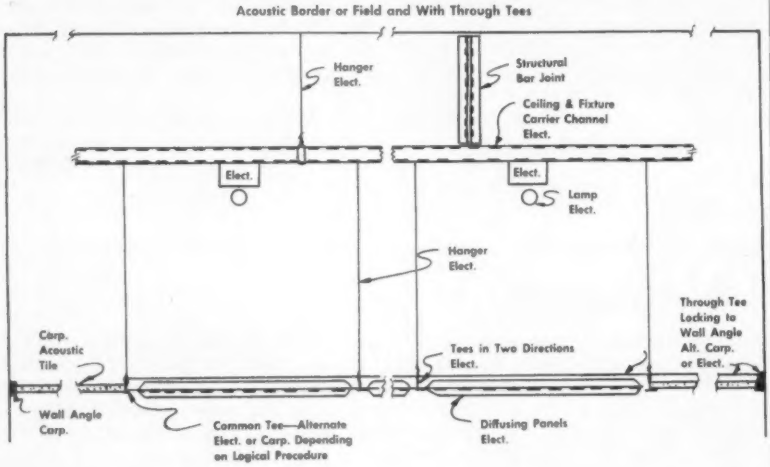
O. William Blaier	Frank Jacobs
Charles Johnson Jr.	Frank W. Graham
Joseph Cambiano	O. A. Rieman
Walter McDaniels	Frank C. Riley

Attached detailed drawings to serve as a guide.

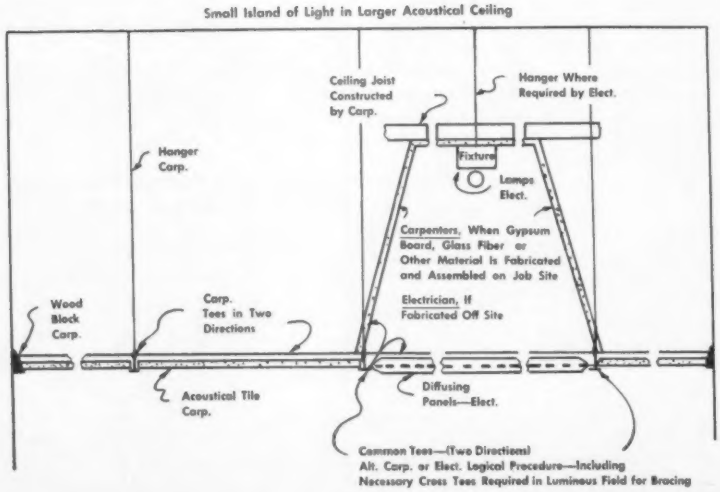
Luminous With Acoustical Border or Field


Carpenters, When Gypsum Board, Glass Fiber or Other Material Is Fabricated and Assembled on Job Site
Electrician, If Fabricated Off Site
Elect.
Elect.
Hanger Elect.
Acoustical Tile Carp.
Tees in Two Directions Elect.
Wall Angle Carp.
Common Tee
Diffusing Panels Elect.
Carp. / Elect. Alt. Depending on Field Job Conditions Par. No. 4 Bracketed Sect.
Varies
Varies

Acoustic Border or Field and With Through Tees



Small Island of Light in Larger Acoustical Ceiling


Ceiling Joist Constructed by Carp.
Hanger Where Required by Elect.
Hanger Carp.
Fixture
Lamps Elect.
Carpenters, When Gypsum Board, Glass Fiber or Other Material Is Fabricated and Assembled on Job Site
Electrician, If Fabricated Off Site
Wood Block Carp.
Carp. Tees in Two Directions
Acoustical Tile Carp.
Diffusing Panels—Elect.
Common Tees—(Two Directions) Alt. Carp. or Elect. Logical Procedure—Including Necessary Cross Tees Required in Luminous Field for Bracing

made where each part of typical systems were labeled showing which trade installs each part and which parts could be installed by either trade on the basis of the "practical procedure."

Recognition is being given to the fact that some electrical contractors are not set up to install luminous ceilings but still may wish to be eligible to do the other electrical installation for a given building. It is realized that this creates a problem.

Where the ceilings, made up of luminous and acoustical elements, are made a separate part of the specifications and plans the work can be bid separately and a specialty contractor equipped and skilled in such ceiling installation can do that portion of the building, employing the requisite electricians and carpenters. The other electrical installation in that building can be done by an electrical contractor in the regular manner.

But where the specifications and plans do not separate these ceilings the electrical contractor who does not himself want to make that part of the installation may still bid it and subcontract the ceilings to such a specialty ceiling contractor.

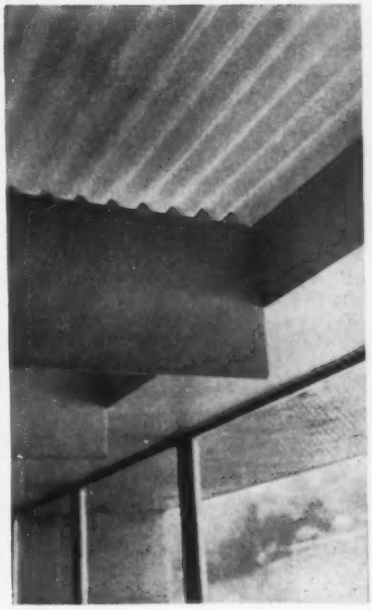
This is done in recognition of the responsibility the unions feel to the architects and the ultimate consumer to insure that the jobs are handled skillfully and in a manner satisfactory to them.

Potential Business

In many localities the electrical contractors have not appreciated the potential business that luminous ceilings and wall panels represent. They have been content to install the fluorescent strips and to leave to the other crafts the installation of all the remainder of the work. Having vacated this portion of the work to other crafts when they later realized that they were being deprived of the work on what is essentially a lighting system, arguments have arisen and even work stoppages have been caused. Meanwhile the owners of the building and the architects and designers have been caught between jurisdictional claims by the carpenters and electricians. This is good neither for the electrical worker nor for the carpenters since it tends to discourage the development of a new method of illumination, which holds great promise.

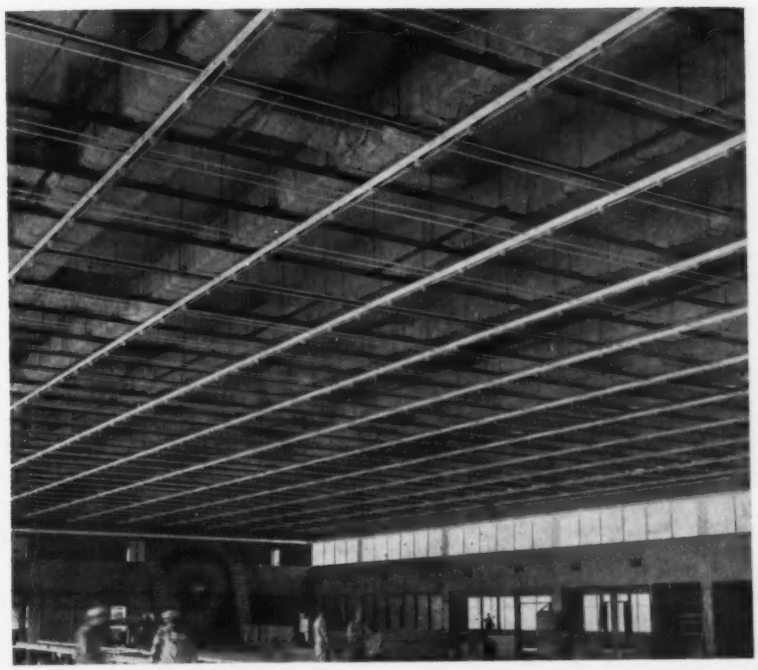
In some localities the issue has caused delays and financial loss to all involved. This agreement between the two unions provides a fair division of work along the lines traditionally done by each of the crafts. Architects should specify the luminous ceiling or wall as an integral system for further clarity.

For the 275 employees in this 96x189-ft area, a total luminous ceiling makes a . . .



Baffle 12 in. deep acts as shield

Sky for Blue Cross



Lamp channels were approved to carry 18 circuit wires to terminal blocks for connections to ballasts. Junction box at the end of each channel simplified the installation.

Like working under the sky, the 275 employees of Blue Cross find the illumination in the Los Angeles building of Hospital Service of Southern California on Sunset and Vermont. Architects Allison and Rible designed the 96x189-ft main office area to be lighted by a special Wakefield luminous ceiling 18 ft above the floor. Instead of the standard 6-in. acoustical baffle, a 12-in. baffle was used both for additional sound absorption and to shield the corrugated luminous panel from view.

To suspend the luminous ceiling a steel channel grid was suspended from the roof slab providing support for air ducts as well. To this grid Pacific Electrical & Mechanical Co., licensed installers, attached the continuous channels of the lighting fixture by means of clamps in record time.

Approval to use the channel as a duct for the low-voltage lighting circuits was given by the city, permitting as many as 18 TW circuit wires instead of AVA. These were run to terminal blocks to which the ballasts were connected.

To light the 18,144-sq-ft area, 682 8-ft and 124 4-ft slimline lamps on 75 15-amp circuits were used. Initial intensity at desk level was 126 f-c. Motor-operated shutters on the south windows are controlled by a solar time switch, reducing the air conditioning load to 150 tons.

Electrical engineering was by Leo Press of Foster Sampson staff. Lester Kelley was air conditioning engineer on the new building.

Electrical West—Vol. 116, No. 5

Plugs and Portables

Grounding Confusion — 6

Tom Hughes
Electrical Engineer
California Division of Industrial Safety

As labor costs have skyrocketed in the last decade, manufacturing and building methods have centered everything around the production line. The workman no longer depends on well developed muscles for a livelihood. Instead, he directs the mechanical efforts of machines.

Of the hand tools that used to be found around a construction job almost everyone can now be displaced with mechanical power. About the only job that has not been done successfully with a power tool is driving nails through lumber and modern stapling machines are about to conquer this problem.

But the production line, to operate successfully, must be shifted or rearranged to suit the needs of each batch of articles being processed and this means that machines are becoming more and more movable. Many large shops have fork trucks that will shift five-ton machines around at a moment's notice. All this, of course, presents the problem of flexibility in power supply.

So, the type S multiconductor cord or cable has become an accepted item in every type of business. This has multiplied the problems of the maintenance men and the safety engineers.

In the preceding articles we concentrated our thoughts on the need of an additional conductor in a distribution system for returning any leakage or fault current to the source and for opening the fuse or circuit breaker. We showed why it is both logical and necessary that we use the metal raceway system for the fault current return path. This whole hypothesis was based upon the use of fixed wiring in metal raceway.

With fixed wiring installed in metal raceway, in accordance with all the requirements of the codes, including effective ground continuity of raceway system, there are only two types of injury normally possible. One type results from opening cases or enclosures for servicing and carelessly contacting live parts. The other type consists of the flash burns caused by burn outs and explosions in enclosures, as discussed in the previous articles.

With cords and portable cables, however, we have another type of accident that is entirely too common and will be with us until the manufacturers take the trouble to modernize the design of attachment plugs. Arcs, caused when plugs are inserted in receptacles, are causing flash burns of the user's hands and often the face. This type of injury happens more often than any other of the electrical injuries.

What's Wrong With the Plugs?

This is getting off the subject of grounding but any discussion of the hazards connected with portable and movable equipment would be lacking and misleading if it didn't include the weakest link. Let's look at the features of the ordinary plug which are causing trouble.

1. The connections are made on so-called binding posts, which are bulky by nature and therefore cannot be given adequate separation. By virtue of their flexibility, cords must have stranded conductors and the strands get separated from the binding posts and short out other binding posts of different polarity.

Also, the binding posts are placed in an open bell-shaped cavity surrounding the prong extensions, where metal filings or conducting dusts and fluids can lodge and short out the terminals.

2. The sheet metal cord grips are entirely inadequate on the average plug design for small loads and the lower voltages. The sheath of the cord backs out of the clamp and leaves the individual conductors exposed to damaging abrasion. If the maintenance man tightens the clamp down to a point where the sheath cannot squirm out he has compressed the rubber or neoprene to a point where resiliency is lost and rapid deterioration must result.

To do a job with no "if," the jaws of the clamp must be placed away from the end of the sheath or reach along it for a half inch or more, so that they don't tend to squeeze it back out of the clamp. They must make contact with the sheath throughout their length and must have their contacting surfaces covered with several slight (preferably sharp) indentations similar to knurling that is common on the knobs of machines.

The BX-connector type of clamp, so common on small industrial plants today, has narrow jaws that flare away from the cord at their edges and then has one indented ridge in the center of each jaw. Instead of applying evenly distributed pressure over the entire surface and no one indentation causing damage, the existing clamp applies a chocker effect that tends to displace that portion of the sheath to either side.

3. The majority of the plugs, intended for rough use, have metal cases or containers. Where the binding posts are placed in an open bell-shaped cavity they are too near the metal case. The strands fray and touch the case, causing the user to receive a shock. Some readers would point out the fact that proper soldering and shaping the ends of conductors at binding posts (as required by the codes) should prevent this but we are discussing design, not workmanship.

4. Few makes of the smaller plugs have skirts that surround the prongs or contacts. All plugs used on 480-v circuits should have skirts, which extend past the ends of the prongs, or other means of confining any arc. One manufacturer even provides a sheet metal skirt on his plugs intended for use on 240-v circuits.

Even if the weak points we have mentioned are eliminated, a plug is still going to produce some arcing when it is plugged in with a short circuit some place in its cord or load. In many cases the prongs and terminal posts of plugs are completely atomized during such arcs, even on 240-v circuits.

5. No regular plug has a spring or flexible sleeve reaching along the cord at its entry to the plug, for distributing its flexing over a longer radius bend. This is not so important at the plug end of the cord as it is where the cord terminates in a smoothing iron or portable saw but it should be considered if the plug is to be as foolproof as possible.

Certain manufacturers have overcome most of the objections we have just listed by permanently molding the cord and plug into a semisoft rubber unit. But this is applicable only where no change in length is required and where the assembly can be made at the factory.

In Fig. 1 we show a simple diagram of a proposed all-purpose, rough-usage plug cap suitable for use on 120- to 240-v circuits. By permanently molding the live parts in a solid Bakelite core there is no chance for metal filings or conducting dust or fluids to lodge in any portion of it. The base of the prongs, where they are crimped to partly surround the ends of the conductors, should be knurled or covered with indentations to get a better grip on the conductor. Advocates of the binding-post type of terminal will say that trouble has been encountered in the past with wires working out of

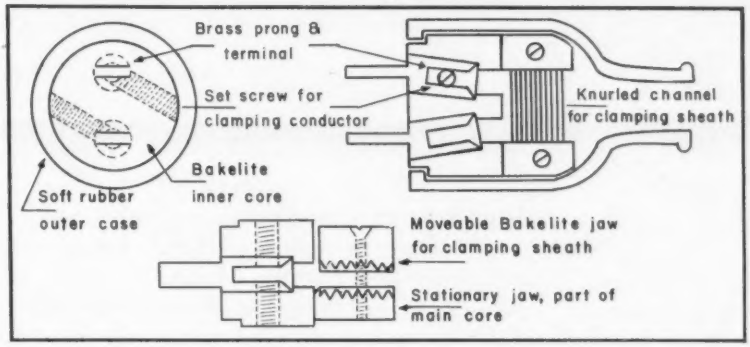

Brass prong & terminal
Set screw for clamping conductor
Bakelite inner core
Soft rubber outer case
Knurled channel for clamping sheath
Moveable Bakelite jaw for clamping sheath
Stationary jaw, part of main core

Fig. 1—Suggestion for a safe cord plug

such socket and set screw type of terminal but this is prevented in this design by the adequate cord grip.

The jaws of the cord grip are designed to secure properly the cord without undue pressure, since they have their inner surface covered with small indentations and extend over a generous portion of the cord sheath. They are part of the Bakelite core.

The outer, semisoft rubber or neoprene sheath is stretched over the Bakelite body after the cord has been connected and clamped. This sheath serves three purposes. It keeps the Bakelite from being chipped or cracked when the cord is dropped on the floor or run over, and keeps dusts and liquids out of the body. Third, the extended sleeve at the rear distributes the flexing of the cord over a longer radius of bend and provides a place for a hand to grip the plug, when removing it from the receptacle.

There is no chance for a shock from this plug unless, perchance, some conducting tool or piece of metal contacts a prong as it is being inserted. Of course, a skirt on a plug prevents even this possibility.

Grounding Metal Cases of Plugs

Most electrical codes require the inclusion of an extra conductor in cord or cable assemblies and an extra prong on the plug, for grounding the equipment supplied by the cord. Where long cord extensions are put together by male and female plug connectors, some inspectors even require the grounding of the metal jackets or cases of the connectors by the grounding conductor.

Here is one of the dilemmas where it can be bad if you do or bad if you don't. Of course, in the large cast metal connectors, where the conductors are so contained that accidental contact with the metal cases is not possible, it makes little difference whether the case is grounded or not. The small, light-duty plugs are the trouble makers.

Take the example where the metal cases are grounded and a worker grasps the female (line side) connector in one hand and the male in his other, to connect two sections of cord together. Some frayed strands, or metal filings, have made contact between a live conductor and the case of the male connector. As the connection is made the worker gets a serious shock from hand to hand through the region of his body containing his heart and other vital organs.

The reader will ask: "How did he get a passage of current through him if both halves were grounded?" The answer is that there are always stray current paths where the worker's skin resistance is lowered by perspiration or conductive dust or chemicals on his hands.

This is a good place to point out that it takes only 10 to 20 ma (amp/1,000) to kill a man and that can be only momentary contact if it catches his heart in the right part of its cycle to throw it into fibrillation. In the example we just mentioned, the shorted strands can easily convey 3 or 4 amp and the contacts of the grounding prong and mating clip may be dirty.

Let's take the other example, where the case of the electric hand tool, such as a saw or drill, is grounded but the case of the plug is not grounded. A man picks up the grounded tool in one hand and the metal-cased (male) plug in the other. A strand is shorted to the case of the plug and again we have current passing through his heart. In this instance, supposedly, grounding the plug case would have maintained the two cases at the same potential.

The real cure, as we previously pointed out, is to make the cases of small connectors from nonconducting material or so place the terminals that it is impossible for the strands to contact the case. There have been many shocks from such cases in the last few years, most of them nonfatal, and one manufacturer of a popular three-prong plug has replaced the metal case of his plug with a semihard rubber.

Grounding Movable Equipment

Here we come to one of the most confused issues of protective grounding. As we tried to show in the previous articles, the word grounding is a misnomer and misleads people from our true objective. In the case of fixed wiring our prime objectives are to return adequately any fault current to the source, so the fuse will blow, and to by-pass or short out condenser capacity that exists between the metal raceway and contained wires. The source, for our purposes, does not go back of the service switch.

With portable or movable electric tools and equipment, though, we have a different problem—that of electric shock to the user. Our prime objective is to maintain the metal cases of this electrical equipment at the same potential as the plumbing, metal frame of the building, other electrical tools, or damp soil outdoors and masonry floors on the ground. Such a pursuit is a wild gamble under the most ideal conditions.

There is an army of inspectors in this country (electrical, insurance, safety, military, and civilian government, etc.) going around checking equipment to see that the cord has a grounding conductor and the plug has the additional prong for automatically connecting the ground. But where do we go from there?

It goes without saying that the mating contact in the wall receptacle must be connected to the metal raceway, if there is a raceway. It may be knob-and-tube wiring or nonmetallic sheathed cable, and electrical continuity must be maintained through the raceway system. Then, if we are really going to complete the job to the best of our ability, we must make a tie between the raceway, metal frame of the building, water pipes, gas pipes, air pipes, sprinkler system, heating ducts, and what have you. This should be done in every building even if there are no hand tools concerned, to prevent interference in communication systems, prevent electrostatic discharges (to be covered in our third series of articles), prevent fires, etc.

As an extreme example of this need, we know of two cases where fires were started by pinholes in gas lines in walls. The gas pipe was in close proximity to conduit or other metal. High-voltage neon lighting systems were connected to use the conduit or other metal as a return path to the transformers and a section of the gas pipe presented a lower impedance path. Periodic arcing to the gas pipe in one spot ate a hole through the wall of the pipe and ignited the tiny escaping gas stream, which went undiscovered for a while.

ELECTRICAL WEST

Paradox in Subsidies

LAST month President Eisenhower did two things that may make sense politically but are somewhat bewildering to all of us poor mortals who are lumped together under the collective term of taxpayers. He vetoed the Farm Bill but strongly urged legislation which would create a soil bank. He signed the bill authorizing the upper Colorado River storage project which would eventually bring some 366,000 new acres of farm land under irrigation.

As we understand it, the soil bank program would be a method of paying farmers to keep land out of cultivation. Such payments come right out of the taxpayer's pocket.

The cost of bringing the upper Colorado River land under irrigation has been variously estimated at between $1,500 and $2,700 per acre. Water users would contribute only 12% as their share of the irrigation construction cost. Power revenues from some of the thirteen-odd power projects were supposed to repay an additional percentage. The fact remains, however, that a large share of the $1½ billion of the total estimated cost will be outright subsidy from the federal treasury.

To be brutally realistic, is the taxpayer's money being used to bring more land under irrigation so that more taxpayers' money can be used to pay people for not farming it?

Luminous Ceilings Clouded

NOTHING could be more indicative of the opportunity for business from the installation of luminous ceilings than the fight that has developed over who would do this work. If it were insignificant, there would be no controversy. But because the potential for business, especially in modernization or remodeling of business buildings, is so great everyone wants to get into it.

First it was a jurisdictional claim jumping by the carpenters and acoustical tile people of the work that should be the electricians. After months of talks and finally top-level conferences under the CIO-AFL peace pact jurisdictional board, an agreement has been reached between the carpenters and electricians.

Eagerly the electrical contracting industry has been awaiting this in order to clarify its own relationship in the complicated construction industry. Publication of the details in these columns should help greatly in this clarification. See p 94.

All this shows a trend in building that will have to be recognized—namely, the integration of several kinds of work into a new kind of package that forms a new unit of construction. A luminous ceiling, in other words, is both a lighting fixture and it is a ceiling. As such, it combines the work perhaps of several crafts. But to the client or the architect, it is one and the same thing and responsibility for it must be placed on one contractor, both for function as a ceiling and performance as a lighting medium.

It would seem, to keep it out of as much bickering as possible, that the architect, engineer or designer should specify it as a complete guaranteed package.

Teamwork Called For

POWER supply problems of the Pacific Northwest will never be solved by such stratagems as the Cowlitz County (Wash.) Public Utility District engages in when it seeks to take by condemnation hydroelectric plants developed and owned by a neighbor utility—plants whose output is already fully devoted to serving the public.

Tactics like this can't help but backfire on the aggressor. They will only hasten the day of a regional power shortage—a shortage that the Cowlitz PUD will have to share equally with everyone else in the Northwest Power Pool area.

The district cannot expect to do hurt to Pacific Power & Light Co., which pioneered the Merwin and Yale projects on which the PUD has filed its suit. The court will see to that. By the time present-day reproduction costs have been figured and large severance

EDITORIAL VIEWS

damages computed, it is considered doubtful that the PUD could finance the condemnation award. Even if it could, the huge investment required would mean a high-cost power supply.

Of greatest concern to the public, however, is the PUD's attempted interference in construction of the Pacific company's new 256,500-kw Swift project upstream from its existing dams. This project has been certified by the Office of Defense Mobilization as part of the nation's desired power expansion program between now and the end of 1958. It is beyond belief that the PUD will persist in its last-minute licensing protests to the point where the project cannot be completed on schedule.

Teamwork, not obstruction and confusion, is dictated by the urgencies of the Pacific Northwest's growth requirements. The best way for the Cowlitz PUD to help solve whatever power problems it may anticipate is to help develop enough power for everybody.

Back to the Home

IN THE past several years lighting has strayed far from the home. Perhaps the war years took all lighting effort the nation could produce to make the factories turn out more material with the aid of better illumination. Certainly home lighting was left to drift back to the dark ages, before people knew any better.

At the San Francisco regional conference of the Illuminating Engineering Society, it was residential lighting that provided the most interesting session. This is a good omen. At last year's conference in Los Angeles, street and highway lighting was the major subject. It is well to return from the highway to the home and take a new look—if one can see in the dark—at what the decorators and the house builders have done to it.

To Live Better . . . *Electrically* certainly a new start should be made to light better electrically. New fixtures and improved light sources are available. Let's get back to the home and renew interest in lighting.

Field Testing

SOUTHERN California Edison engineers have convinced themselves that field testing of equipment is valuable. They have provided facilities for testing circuit interrupting devices under actual system operating conditions. Results to date have indicated that this type of proof-testing fills a void that has existed in the application of electrical equipment.

On one hand, the fault currents and complexity of modern power systems make the selection of ratings of equipment for specific applications more difficult. The reliability of service is increasingly important as consumers become more and more dependent upon their electric power supply. On the other hand, the wide varieties of rating and designs available for any specific piece of equipment make it highly desirable that actual performance (and reserve) characteristics, as well as a name-plate rating, be known.

Field testing is not to be looked upon as a method of comparing one manufacturer's product with another. Rather, it is a way of determining the capabilities and limitations of various classes of equipment, their performance when subjected to conditions beyond their rated capacity, and even the results of failure and disintegration under extremely severe duty. The latter type of knowledge is particularly important in designing for the safety of both other equipment and personnel.

Thus field testing provides the basis for intelligent application of equipment capable of handling the future burden that the present rapid growth of load will entail. With interrupting devices, this is important. A piece of equipment correctly installed to meet the present load or fault duty may not be called upon to operate under fault conditions for several years. By that time energy dissipation requirements resulting from circuit changes and additional system capacity may have completely changed the interrupting duty requirements. Field testing is one way of making accurate predictions upon the behavior of equipment under the severest kind of conditions.

A MESSAGE TO AMERICAN INDUSTRY • FIRST OF A SPECIAL SERIES

THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

How Critical Is It?

The United States is running into a serious shortage of scientists and engineers. There is no novelty in this observation. It has often been made in the last few years. And there has been mounting alarm about what this shortage may mean for both our national security and our prosperity.

There would be great novelty, however, if general agreement were attained on such important matters as the size of the shortage, the extent of the damage it threatens to inflict, and the best ways to eliminate it. The purpose of these editorials is not to provide this novelty, but to ventilate some of the key aspects of the shortage of scientists and engineers.

This first editorial in the series is designed to throw light on the over-all dimensions of the shortage. Others to follow will be addressed to such questions as:

- How serious is the threat to our economic well-being and to our national security?
- What needs to be done to prevent the shortage from becoming critical?

Rise Has Been Rapid

The problem is *not* that we have been producing a small number of engineers and scientists. Indeed, the number has risen sharply. We now have a working force of more than 600,000 engineers, over twice as many as the 286,000 there were in 1940. And we have about 250,000 scientists (chemists, physicists, biologists, geologists, mathematicians, etc.), compared to only 92,000 in 1940. About one in 148 persons in the labor force of 1940 was a scientist or engineer; today the ratio is about one in every 80.

In research and development work, where highly creative scientific minds are required, there has been fully as rapid a rise in employment of scientists and engineers. Fewer than 90,000 were employed in research and development fifteen years ago; the total now exceeds 200,000.

—But Not Rapid Enough

Despite this rapid increase in the number of scientists and engineers—at a rate much faster than the increase in the labor force as a whole—the needs of industry, government and education for technically trained people have risen even more sharply.

The principal reason for this mounting demand is the prodigious growth of research in the last 15 years. From a total of only about $900 million spent on all types of research in 1941, the annual expenditure rose to over $5 billion by 1953 (the latest estimate available). Over two-thirds of the research is done by private industry, mostly to develop new and better products and to find new and better methods of production. Most of the rest is performed by the government, largely to develop improved and inevitably more complex scientific weapons.

One aircraft company has found from its own experience that it required 17,000 engineering manhours to develop a typical fighter plane in 1940. The requirement is now about 1.4 million engineering manhours. Development of the typical fighter plane of 1960 will require well over 2 million engineering manhours.

In this dramatic example, the need for engineering services for a basic piece of military equipment soared 80 times in 15 years. It is an indication of why the demand for more and more technically trained men and women has outstripped even the imposing increase in scientific and engineering manpower of the last decade and a half.

Size of the Gap

Exactly how great the gap is between the available supply of scientists and engineers and the number required, it is impossible to say. In some instances technical talent undoubtedly could be better used than it is now. And part of the shortage might "disappear" if higher salaries had to be paid. (These questions will be discussed in later editorials.) But informed estimates of the approximate size of the gap can be given.

- According to the best available information, from estimates by the Engineers' Joint Council and the U. S. Bureau of Labor Statistics, **the minimum need for engineers from graduating classes is 40,000 each year for the next ten years.** Last year we graduated only 23,000 engineers, just about enough to cover replacement needs without allowing for any expansion of the number of active engineers. Projections made by the U. S. Office of Education indicate that we shall probably not have a class of 40,000—the *current* annual requirement —until 1963.
- According to Dr. Howard Meyerhoff, executive director of the Scientific Manpower Commission, **there is now a shortage of about 20,000 scientists.** Last year the number of doctoral degrees in the natural sciences, almost a prerequisite for research work, was only 5,000. Dr. Meyerhoff estimates that the shortage of scientists will rise another 30,000 by 1960.

More Needed As Teachers

Not all of the graduates with scientific and engineering training, furthermore, will work as scientists and engineers—that is, by performing research and giving it practical application. Such training is now necessary in many sales and management positions. And more of our technically trained men and women must remain in educational institutions as teachers if the quality of engineering and scientific education is to be maintained. A survey in 1954-55 by the National Education Association showed that, out of 277 universities, state colleges and large private colleges, nearly one-third *already* had unfilled vacancies in engineering and three-fourths had vacancies in physical sciences.

The dimensions of the shortage of scientists and engineers can be summarized as follows: **Despite a substantial rise in the trained manpower available, the needs of industry, the government and education have risen still faster. The best information indicates that, on the basis of current and anticipated needs, our recent yearly rates of production of slightly over 20,000 engineers and about 5,000 PhD's in natural sciences could be doubled without closing the gap entirely.**

The disturbing implications of this shortage for our national security and our prosperity and some practical suggestions for eliminating it will be the subjects of subsequent editorials in this series.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Ingledow
B. C. Electric

Naughton
Utah P&L

Hatch
Washington WP

Steede
B. C. Electric

Scott
Idaho Power

Hodge
Portland GE

Northwest engineers join

Hands Across the Border

Despite the invisible border that separates us, we of this association must work together to maintain the leadership of the private power industry, said T. Ingledow, vice-president and executive engineer of the B. C. Electric Co., in opening the 33rd annual conference of the Engineering and Operating Section of the Northwest Electric Light & Power Assn., held at Vancouver April 11-13. We recognize our responsibilities of leadership and it is through workshop meetings of our association, such as this, that we must preserve that leadership, he said.

In response E. M. Naughton, president of the Utah Power & Light Co. and vice-president of the association, said there was a great diversity of problems in the association and that meetings of this kind serve to integrate ideas and problems and find their solution. This is a grass-roots organization, he said, that makes possible close association of companies on both sides of the border for pooling knowledge to attain maximum benefits. He stressed the importance of human relations in engineering, and on the problem of the shortage of engineers suggested using men of lesser training for ordinary problems and even the use of women for drafting to solve the problem.

Purchasing, Stores

E. Bayles, Chairman

The final general session was given over to the purchasing and stores group who met jointly with the E & O Section. Fred Hodge, purchasing agent, Portland General Electric Co., said the purchasing agent had a great interest in standardization because it means lower costs on standard items, helps to solve warehousing problems and makes possible carrying less stock. He emphasized the need to find methods of lowering investment costs; questioned manufacturers' sales policies that result in a great disparity in bids, such as a recent case where there was a difference of 47% in bids on OCBs. On another subject he chose to speak on, he said we are witnesses for the defense and must do something to defend ourselves in the court of public opinion. We are the subject of unjustified invidious attacks by politicians and others, he said, and we must do something about it.

Tom Connelly, Joslyn Mfg. Co., Chicago, said the ASTM feels that we are using too much timber and that pole classes probably will be reduced by one to help alleviate the pole supply problem. On the subject of crossarms, he said that rigid standardization of specifications as to size and grade of lumber are making supply very difficult because lumber to meet crossarm specifications is much more valuable when made into plywood. No relief is in sight until 1957, he said. At present laminated crossarms are about twice the price of present arms and the cost of synthetic poles appears at present to be five times the cost of wood poles, he concluded.

Kenneth Geist, Allis-Chalmers, Milwaukee, said utilities should try to avoid buying in cycles, thus creating shortages and running up prices.

Power Production

Nathan L. Scott, Chairman

In opening the power production session M. F. Hatch, chairman of the

Kingsbury
Ohio Brass

Snow
NWEL&PA

Reid
Portland GE

Bossuyt
General Electric

Russell
Idaho Power

Fisher
Calif. Oregon Power

Alger
Puget Sound P&L

Bullard
Ebasco Services

Radford
Utah P&L

Schwager
Schwager-Wood

E & O Section, said that an area load growth of 14.3% last year, against only 12% planned, pointed up the importance of regional power supply. Importance of the fish problem is shown by the fact that one-third of some 12,000,000 kw in the planning stage is fouled up with the fish problem.

There was encouragement on the fish problem in the report of R. T. Pressey, fisheries research, State of Washington, in which he said that important progress is being made in experiments to get fingerlings downstream past high dams. Electrical guides for the fish and changes in spillway design to allow free fall appear to be the solution to one of the major problems of fish and high dams, he said.

V. W. Ruskin, B. C. Electric, described his company's four 23,000-kw gas-turbine plant now under construction. He said a gas turbine was an ideal prime mover to operate at low annual load factor to firm up hydro.

C. R. Midtlyng, Rocky Mountain Nuclear Power Study Group, said he believes that we can develop a better reactor than those now under consideration. He thinks not nearly enough consideration has been given to hazards of operating power reactors.

R. M. Bibbs, B. C. Electric, described the off-peak electric heating system to be installed in his company's 22-story office building now under construction. There will be two boilers and two storage tanks of 16,000 imp gal capacity each. The boilers will each have 900 kw in insert heaters that will hold water to a temperature of 350° under 120 psi.

Discussing electric space heating, J. C. Beckett, Wesix, San Francisco, said: "With new information constantly being made available on the characteristics of the all-electric home, the 'scared thinking' that has prevailed in too many sections in the past cannot continue."

Advantages and the economy of a combined steam-gas turbine cycle were discussed by P. G. Morse, General Electric. He cited as benefits: boiler weight and volume are radically reduced; volume of the power plant building is reduced; boiler forced- and induced-draft fans are eliminated; the steam boiler may be started more quickly; less plant erection labor; and, importantly, higher efficiency (6½ to 8% increase compared to supercritical steam plant with second reheat stage).

A fire detection system, new to the U. S., that is sensitive only to combustion gas, was described by J. A. Whitlock of the Pyrene-C-O-Two Co. He predicted that the system would obsolete all others because of its extreme sensitivity and almost immediate response, even to smoldering fires.

Electrical Equipment

D. R. Russell, Chairman

In its present stage of development, the vacuum switch is ideal for high-voltage line dropping and capacitor switching, said H. H. Schwager of the Schwager-Wood Corp., Portland.

N. S. Kent, B. C. Electric, discussed corrosion in station grounding and W. H. Fisher, California Oregon Power Co., reduced BIL general practices.

On the subject of aluminum buses, Fisher reported no trouble with bolted connections that were greased. R. P. Mortell, Puget Power, reported successful welding of aluminum shapes and buses. Consensus favored strain-type buses as compared with rigid. Regarding series capacitors, it was stated that series capacitors to increase transmission capability would cost four times as much as bundled conductors on a 345-kv line to transmit Snake River power to Portland.

Brewer
Montana Power

Kelly
Puget Sound P&L

Crosby
Washington WP

Johnson
Sangamo Electric

Lewis
Calif. Oregon Power

Green
B. C. Electric

Hall
Idaho Power

Satre
Washington WP

McAdams
B. C. Electric

Bibbs
B. C. Electric

Bayles
Pacific P&L

Ruskin
B. C. Electric

Meters-Electronics

R. Crosby and H. M. Lewis, Chairmen

Thermal demand meters in their many special forms have proved to be of valuable assistance in obtaining data essential to dealing with distribution problems, said L. D. Johnson, Sangamo Electric Co., San Francisco, in speaking before the meter group.

Glen Madland, Motorola Inc., Chicago, said that the transistor, because of its extraordinary life, low power consumption, small size and minute weight, is a new tool of great significance to the power industry. Typical power consumption of a transistor is 3 to 10 milliwatts as compared to 1 to 3 w for a miniature vacuum tube, a ratio of 1,000 to 1. The transistor provides amazing reliability, he said, because failure does not occur suddenly as in a vacuum tube, but rather at a very slow extended process.

T. W. McLean, Washington Water Power, said his company was using large d-c generators with smaller pulleys for mobile radio power supply to reduce engine speed and thereby save in maintenance costs on engines.

Microwave, radio and TV interference, wire line carrier and FCC reduction of band widths were other subjects discussed.

T & D

E. P. Kelly, Vice-chairman

Problems with bundled conductors was the subject of much discussion. F. O. Wallaston, B. C. Engineering Co., said experience with B. E. Electric's 345-kv line showed the necessity of prestressing ACSR conductors before stringing and sagging; that new conductors cannot be strung with old conductors; that adjustable links at dead-ends were necessary to sag the two conductors alike; that ½-in. difference in elongation meant a difference of 1 ft in sag in an average span.

A. M. Phillips, Alcoa, discussed bundled conductors and then made the revealing statement that with the aging of conductors there is a marked decrease in radio interference.

W. A. Bullard, Ebasco Services, said it was time for manufacturers and utilities to pool studies on higher residential utilization voltages; suggested use of higher voltage systems in selected cases to gain experience; predicted pressure will force code changes to permit higher than 150 v to ground; that EEI recommends 265/460 v with 255/440 v as an alternate; that the present 120-v standard will be edged up to 125 v gradually. T. J. Bliss, Westinghouse, said that a study of five types of system showed that a system utilizing 265/460-v secondary with 34.5-kv primary and a 1-kva dry-type transformer for small appliances showed a saving of 47% as compared with a single-phase, 4-kv, 120/240-v system.

S. E. Caldwell, Portland General Electric, introduced a thought-stimulating subject when he said he felt it was time that power companies accumulate records and set up service continuity standards in view of the importance of residential loads.

E. Bossuyt, General Electric, said that a combination of regulators and capacitors provide the best voltage control, both from the standpoint of quality and economy.

G. Morrison, Washington Water Power, said the fast recovery water heater is doing a job both for the customer and the utility, and should help utilities to retain the water heater business in competition to natural gas, soon to be available in the Northwest.

C. S. Alger, Puget Power, described microwave cooking with the new electronic range that uses only one-third the energy of conventional ranges. Present cost is about $1,350.

R. A. Blakeney, Portland General Electric, described production line methods used in the installation of street lights in Portland's $10,000,000 street lighting program.

R. E. Sinclair, Pacific Power & Light, gave highlights of Portland's new electric space heating code adopted for the protection of the customer against inadequate and poorly designed installations.

Social events, ladies entertainment and several inspection trips rounded out a well arranged conference for the approximately 250 who attended the meeting. Next year's conference of the E & O Section will be held at Sun Valley, Idaho, around the first of May.

IAEI

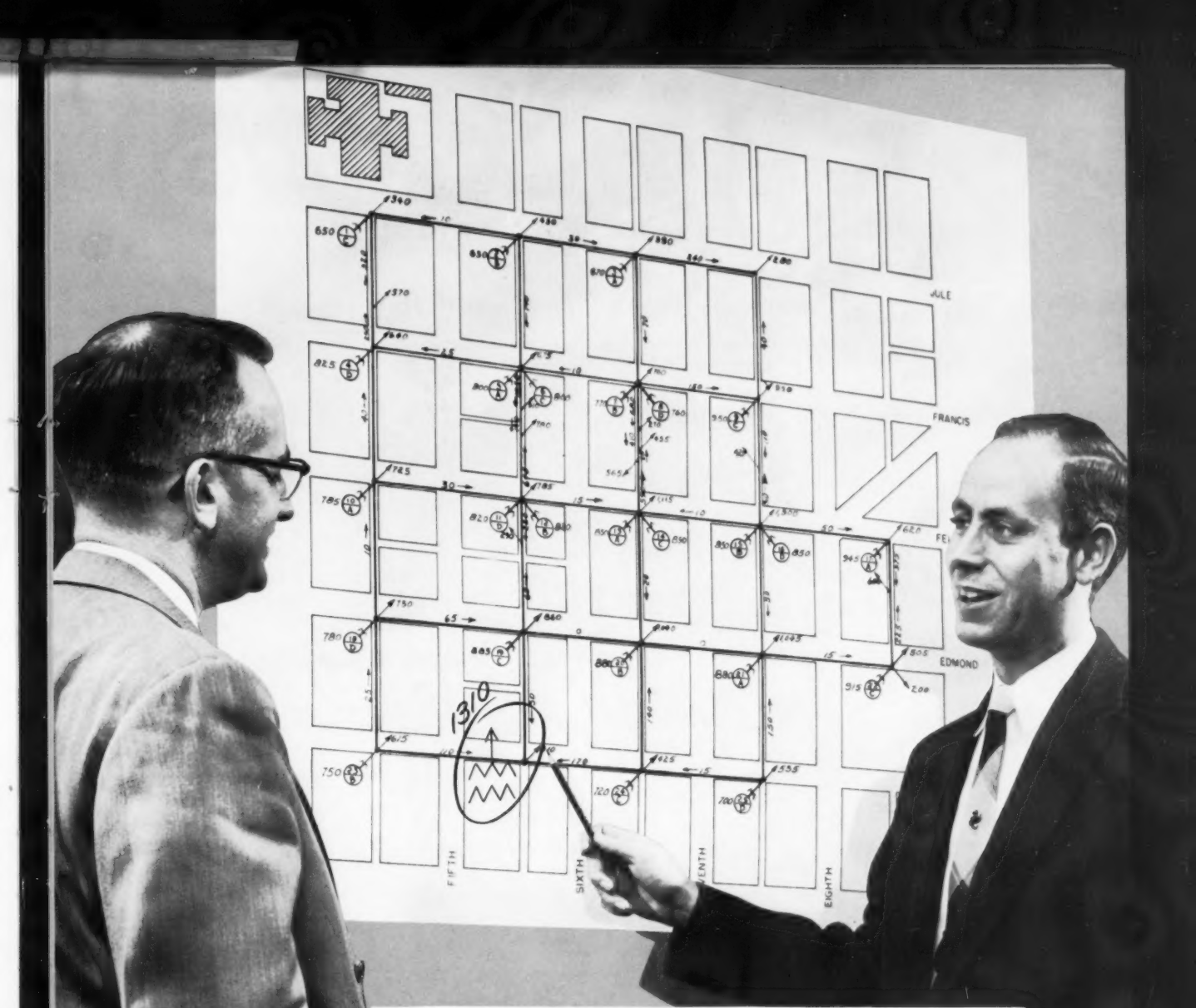
A series of chapter meetings in the West was timed so that Charles L. Smith, International Association of Electrical Inspectors secretary-treasurer, could attend. Dates were rearranged and chapter meetings combined to meet his travel schedules during April.

Arizona Chapter met at Phoenix April 5, Southern California Chapter at San Diego April 11. Three chapters met at Fresno April 17—Northern California, Sacramento Valley and Central California. Utah Chapter held a luncheon with Mr. Smith and a dinner meeting at which new officers for the year were elected.

Idaho Chapter was the last meeting Smith could attend because he was called back to Chicago. Other meetings in Washington and Oregon had to be canceled. Full report of the Idaho Chapter meeting in Boise April 19 will be carried next issue.

IES

Three regional conferences of the IES were held in April and will be featured in the Convention issue next month. Significant news and commentary about the conferences will be found in the Contractors' News Letter.



Good news from Westinghouse . . .

To help you solve network system problems

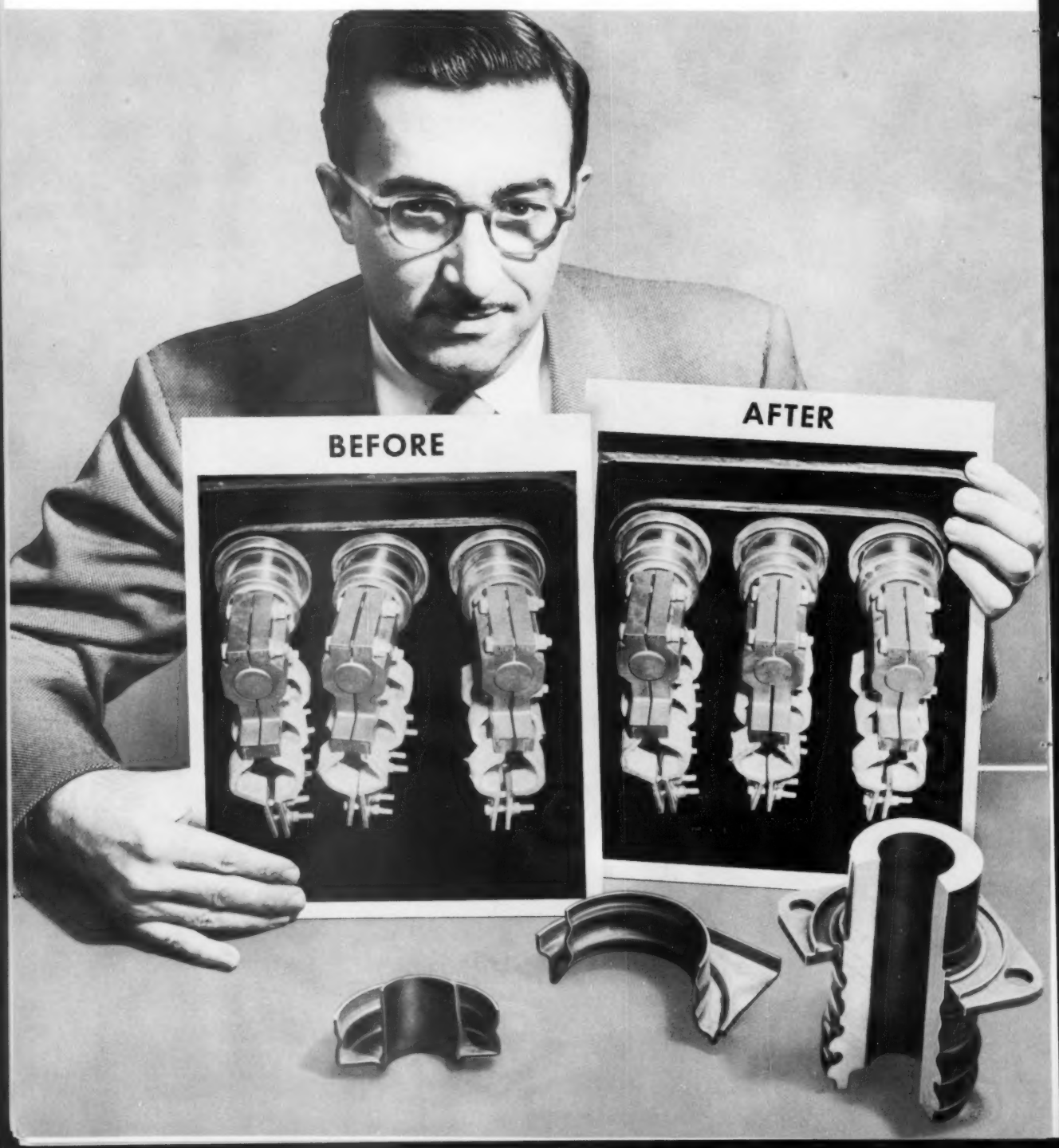
Changing times—changing patterns of working and living—create continuous problems in the operation of networks. Every day, utility executives and engineers come to grips with such diverse problems as maintenance, expansion needs, a broad variety of load densities, zoning and rights of way.

By virtue of experience dating back to the first installations, plus a complete line of network apparatus, and engineering service, Westinghouse is prepared to help you solve network system problems. On the next 7 pages, R. F. Lawrence, Westinghouse Distribution Engineer, cites typical examples.

Westinghouse

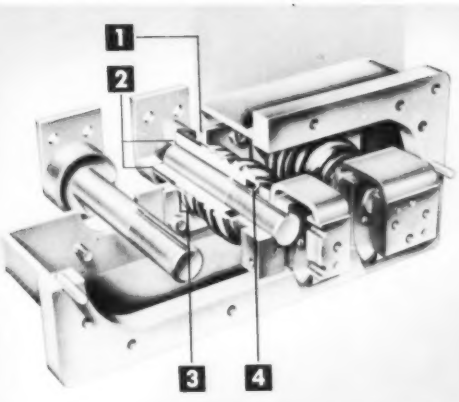
"Bushing leakage on network transformers has been a long-standing industry problem. V. H. Hahn, Network Transformer Sales, explains how Westinghouse solved it."

V. H. Hahn points out the displacement of a new RFW bushing that was damaged in shipment. Even after the studs were forced back into position, they remained leakproof . . . no permanent damage.



problem: **Getting leakproof bushings for network transformers**

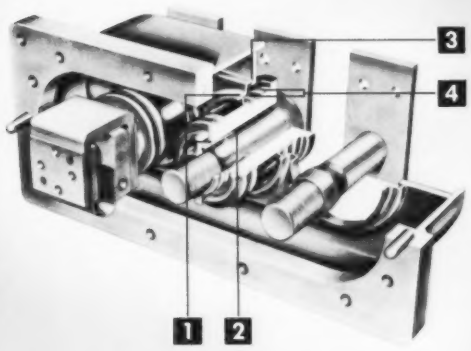
solution: **New double-seal rolled-flange bushings**



Type RFG low-voltage bushings for network transformers

1. Tank-to-bushing seal: retained Cortite gasket
2. Stud-to-bushing seal: retained Cortite gasket
3. Rolled seal: silicone (Silastic*) rubber
4. Stud and porcelain interlocking washer

*® *Dow Corning Corp.*



Type RFW low-voltage bushings for network transformers

1. Copper-to-copper inert arc welds
2. Sealing sleeve permanently brazed to stud
3. Copper bushing plate brazed to tank wall
4. Silicone-rubber rolled seal

A radical new bushing design . . . 1200 already in service, without a single instance of leakage! That's the record to date.

The leakproof qualities of the new design were dramatically, if unintentionally demonstrated when a 1000-kva 3-phase network transformer was damaged in shipment to Consolidated Edison of New York. The photographs, on the opposite page, show the severe displacement of the low-voltage bushings. Jacks were used to force them back into correct alignment. Although they had undergone severe shock of impact and the strain of straightening, the bushings remained leakproof . . . when straightened, were as good as new.

The new Westinghouse Type RFW (rolled-flange, welded) low-voltage bushing has the metal sleeve of the flange double-rolled into the contour of the porcelain over silicone-rubber rings. This assures resilience, yet creates a permanent bond. The conductor is sealed to the insulator at the outer end, and the bushing into the tank, by inert arc welding. The result is a hermetic seal without gaskets.

For applications where bolted bushings are preferable, Type RFG (rolled-flange, gasketed) can be furnished. Here the stud is sealed to the insulator, and the mounting flange to the tank, by Cortite* gaskets. A recess in the flange makes uniform gasket compression positive.

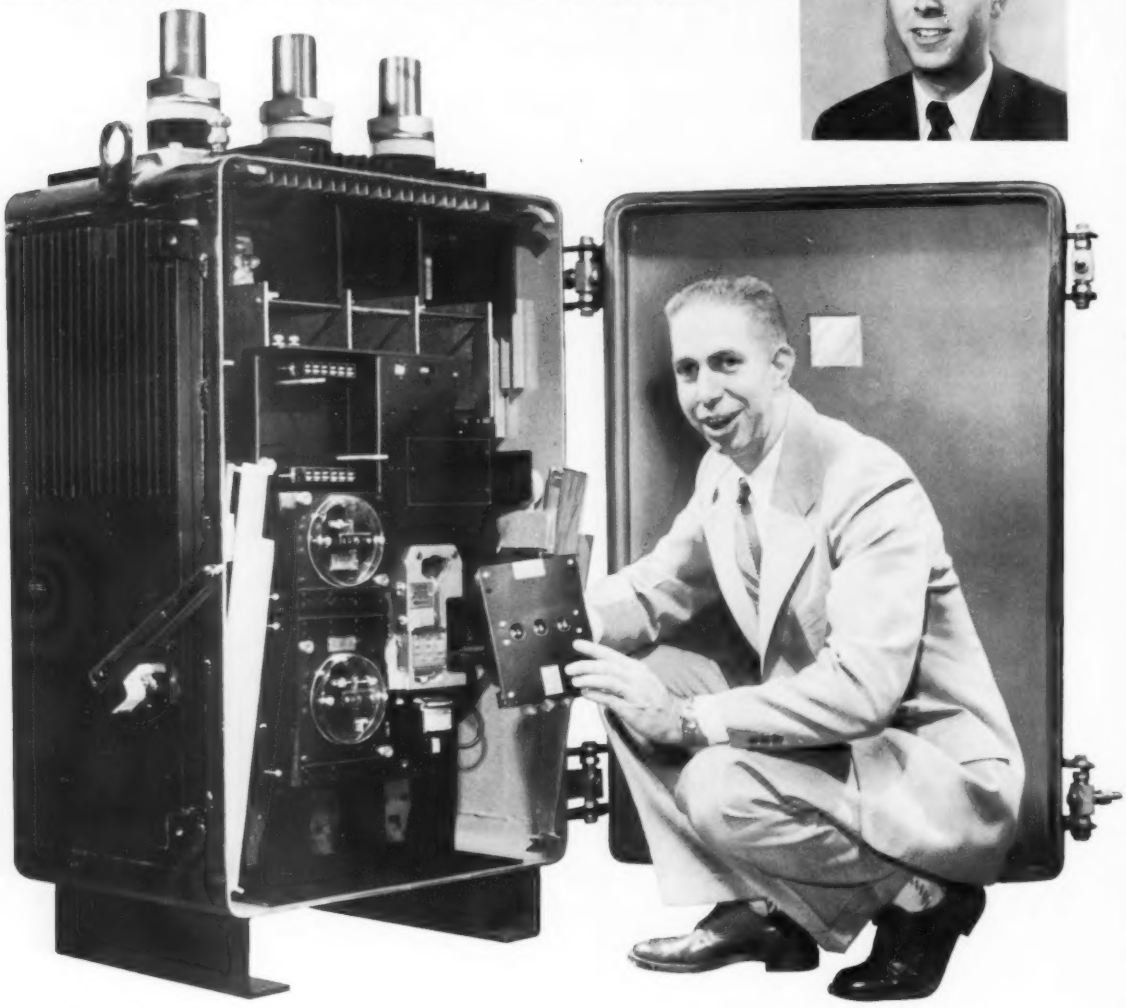
Either style assures a complete oil seal that is rugged, resistant to mechanical and electrical shock—one more safeguard to the high quality of performance designed into Westinghouse network transformers.

*Trade-Mark

YOU CAN BE SURE...IF IT'S

Westinghouse

"Built-in flexibility—such as Westinghouse network protectors and unit substations—helps relieve the system strains caused by load growth."



E. Stohr, Design Engineer, shows a newly developed plate with ammeter jacks that can be used on all CM-22 and CM-44 network protectors. This simplifies periodic checking of changing load density patterns.

problem: Handling commercial area load growth

solution: Protectors that keep pace with the need

The Westinghouse line of automatic network protectors is well fitted to the dual role of meeting change-over or expansion requirements . . . without penalizing quality or reliability of service.

The CM-22 heavy-duty protector . . . in submersible or ventilated dry-vault types . . . is designed for service in heavily loaded areas. The CM-44 . . . in submersible, dry-vault or weatherproof, pole-mounted types . . . is for locations of medium load. And for light-density areas, the CM-88 is ideal.

In addition to meeting any variant of service, Westinghouse protectors help you save on investment as system changes are made. The CM-22 readily replaces the CM-44 when loads increase, without upsetting system coordination—the relays are identical. The replaced protector can be moved to lighter loads.

Extending low-cost network protection in new or growing outlying areas is a simple matter . . . the outdoor, weatherproof CM-88 mounts on poles like a transformer.

Controlling all Westinghouse protectors is the high-torque CN-33, 3-phase induction master relay . . . sturdy, compact and dependable, long wearing.

problem: **Fitting the power supply to the load**

solution: **Long-term flexibility in unit substations**

Three *standout* advantages protect your investment in Westinghouse unit substations.

First, coordination in design and manufacture. Equipment components are engineered and factory-assembled to work together in a convenient, dependable arrangement. Design, engineering and manufacturing are the sole responsibility of one experienced organization.

Second, a Westinghouse unit sub provides the physical and electrical flexibility that marks it a system investment with a future. The unit sub not only helps you bring distribution close to load . . . a saving in itself . . . but helps you accommodate changes in load density on short notice. Transformers can be changed—and quickly. When load grows or shifts, an entire substation may be moved with minimum service interruption, with 100% equipment salvage.

Third, unit subs are compact and attractive in appearance, which means minimum real estate investment, less likelihood of community restrictions. Location of stations for efficiency, expediency and acceptance is an easier problem with Westinghouse equipment.

Westinghouse unit substations are a practical, economical, long-term investment. The facts speak for themselves.

YOU CAN BE SURE...IF IT'S

Westinghouse

This unit substation is a good neighbor, points out G. Metzler, Manager, Unit Equipment Sales. Not only neat and attractive, this Westinghouse unit uses a minimum of space, and features the completely safe dead-front construction.

"Here's the quickest and most economical solution to the headaches brought on by overloading of networks: specially designed Westinghouse network capacitors and equipment."

problem: Overloaded network transformers

solution: Network capacitor . . . inexpensive, submersible, easily installed

There is no faster, less expensive way of raising network capability, when you're faced with both overload and decreased power factor, than with Westinghouse network capacitors.

At far less cost, network capability can be improved with the new Westinghouse 13½-kvar, 216-volt secondary capacitor than with installation of larger transformers or network protectors. Studies have shown, for example, that application of an 80-kvar capacitor bank with a 500-kva transformer may produce a usable load-capacity gain of up to 11% at 85% power factor. An installed cost of $46.00 for the capacitors results in a gain of one kva of network capacity.

Specially designed for underground use, the Westinghouse capacitor will operate in 55°C ambient temperature. The steel case is protected against corrosion by a heavy coat of zinc, covered by an organic paint finish. Even when subjected to salt water immersion these units last many years, and in dry vaults, 25 years—maintenance-free. The capacitor is equipped with a newly developed current limiting fuse to remove any short-circuited unit from the line before the case can rupture, even under high fault current.

Because of its compact design, the Westinghouse network capacitor requires little space . . . this may be a decisive factor when considering existing vault area. Capacitors may be ordered singly, or as factory-assembled and wired racks in multiples of three (40, 80 or 120 kvar). These racks can be mounted on floor, wall or ceiling.

Basic electrical reliability is paramount in the design of network capacitors. Specify Westinghouse for an easier and more economical way to buy, apply and install them.

H. Brooks, Supervisory Capacitor Engineer, points out how the special neoprene sleeve waterproofs and insulates both fuse and terminal connections of Westinghouse network capacitors.

This Westinghouse network capacitor equipment, furnished factory-assembled and completely wired, is rated 120 kvar to serve the Westinghouse 500-kva network transformer. Note accessibility, and minimum space required. This installation was made by Alabama Power Company, in downtown Mobile.

YOU CAN BE SURE...IF IT'S

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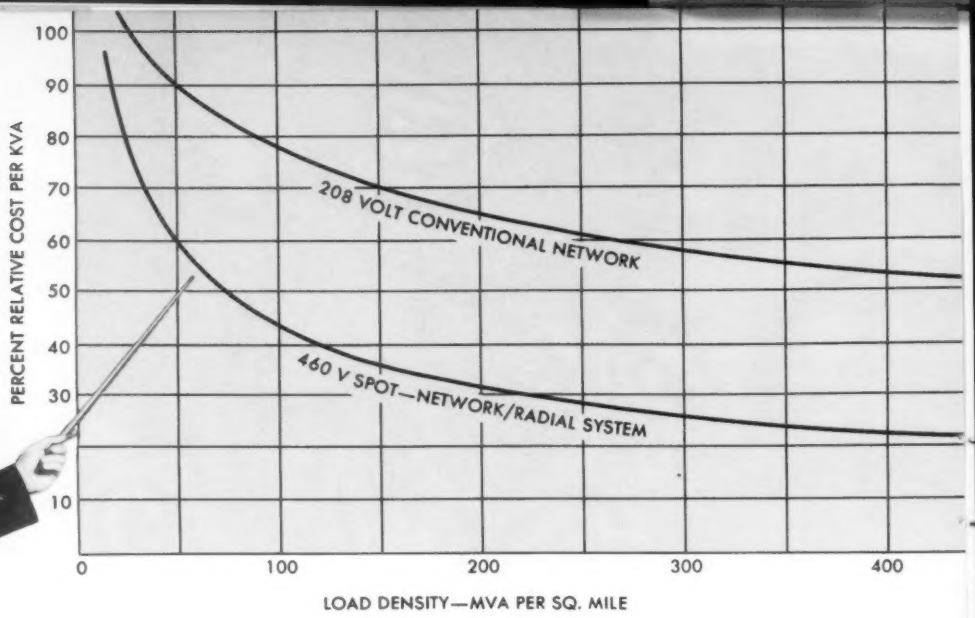

This chart helps explain the interest in higher distribution voltages for commercial areas and buildings. It demonstrates the savings of a higher secondary voltage spot network radial system over a conventional 120/208-volt network.

problem: **Concentrated load areas**

solution: **265/460-volt spot network systems**

Westinghouse studies proved it—utility acceptance confirmed it—higher distribution voltages are the most practical and economical solution for heavily concentrated loads in large commercial buildings and commercial areas.

A joint study with a large eastern utility showed that a nominal 265/460-volt spot network radial system of a-c secondary network for high load densities—60,000 kva per square mile and up—offered savings up to 25% in original investment over a conventional 120/208-volt network. Another Westinghouse study of a similar system applied to a small city with a projected average load density of 120,000 kva per square mile offered similar savings over a conventional network.

This new concept of commercial area distribution is based on one or more 265/460-volt multi-transformer spot networks which not only serve large spot loads, but also supply, via multiple radial circuits, nearby loads. These radial secondaries also supply 3-phase autotransformers which step down to a nominal voltage of 120/208 volts and are connected into a secondary grid.

In addition to lower original cost, such systems offer important advantages to both utilities and power users. Higher voltages mean lower losses and thus more revenue for utilities. Users benefit from economies of direct feeding of large motors for air conditioning and modern fluorescent lighting.

Call The Man With The Facts for solutions to your network problems—or for more facts on the apparatus presented in the preceding pages. He's your nearby Westinghouse Sales Engineer—backed by 33 years of Westinghouse leadership and experience in a-c secondary networks. Or, if you prefer, write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

CP-1034

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PCGA President

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PCEA-PCGA Joint Conference looks at

The Art Gallery of Business

"Means and Ways—the Art Gallery of Business," while it was the title of a talk by W. T. Quinsler of Arizona Public Service Co., is also descriptive of the joint spring conference of the Pacific Coast Electrical Assn. Administrative Services Section and the Pacific Coast Gas Assn. Accounting Section.

About 175 people attended the two-day meeting, held at Pasadena's Huntington-Sheraton Hotel April 18-19. Four parallel sessions were devoted to discussions on finance, legal, right-of-way and land, and stores department problems of utilities.

The four sessions, each featuring outstanding experts in the respective field, proved to be "galleries" where current methods and trends in electric and natural gas utilities were viewed with interest.

Guy W. Wadsworth Jr., president of PCGA and a luncheon speaker, drew an enthusiastic response to his talk titled "Nonfinancial Incentives."

"Workers throughout the country have been drenched for years with economic doctrine which, in effect, says that it is the bare bones obligation of your employer to pay you what you feel you must have to live on," Wadsworth said.

Management, adjusting to new financial exactions caused by the attitude of the labor force, has "written off the rank and file employees as an unresponsive, irresponsible group, as indifferent toward its own practical position as a joint venturer in an enterprise as it is toward simple economics," Wadsworth said.

This attitude of management applied clear down the line in dealings with employees is causing U. S. businesses to pay double the number of dollars for about the same output per employee received in 1940. Wadsworth said nonfinancial incentives deserve serious consideration as a possible way to alleviate the current problems.

Wadsworth discounts the more or less standard "morale moves" as very effective nonfinancial incentives. His view is that two basic beliefs of every worker must be satisfied. First, the individual has to think well of himself and, second, the individual believes that he has no essential shortcoming or fault that he cannot overcome. The two beliefs must be honored in all dealings with the employees, and this takes place at the point of contact, directly on the job, and the immediate supervisor is the key man for providing the two important nonfinancial incentives for doing more and better work.

Acquiring New Capital

"I have pointed out the changing (increasing) status of American incomes. I think therein lies the answer to where we must look for the new sources of private capital." This was a statement by W. G. Paul, president of the Los Angeles Stock Exchange, at the second luncheon meeting.

Paul takes the view that business, with a current ratio of 75% debt and 25% equity, can no longer take the chance of doubling corporate debt every 10 years as in the immediate past. "I would like to, and do, dream of the day when it (equity-debt ratio) will be 50-50. Industry should—and I feel must—look for and secure partners rather than creditors.

Paul said a more favorable equity-debt ratio will help business during periods of hesitation, adjustment and even recession, and avoid the threat of payment demands by creditors at times when business is least able to pay.

The need for a better ratio comes at the same time that industry must acquire more than $35.5 billion annually for the next 10 years to establish new and expand old industries. Industry can provide about 60% of the money but the rest must come from the man on the street.

Finance

W. T. Quinsler, Sponsor

Sponsor William Quinsler, Arizona PS, used a novel "Art Gallery of Business" theme to show how the mysteries of the world of finance could be explained to the average person, and more particularly to employees.

He said: "Every utility man in this room owes it to himself and to his company to become generally acquainted with the financial picture of his company and intimately acquainted with the part he plays in shaping this picture, irrespective of his supervisory position in his company."

Following Quinsler's lead, Smith B. Davis, assistant treasurer and financial analyst of So. Calif. Ed., used the title "A Picture Is Worth 10,000 Words" to give his layman's-level description of

Sheeks
PG and E

Quinsler
Arizona PS

Swanson
PG and E

Cleveland
So. Calif. Gas

the balance sheet and the financial difference between different kinds of businesses. He then presented an illustrated talk explaining how utility stocks are evaluated, using those attending as an investment committee. He presented facts about two companies. The audience, at the end of the discussion, selected the stock of one by a majority vote, making their decision just as a real investment committee would have done. The opening of a sealed envelope after the vote revealed that the group had selected the better utility stock.

"Our Artist's Theme Is Money—Easy Come? Easy Go!" gave Walter J. Herrman, vice-president of So. Calif. Gas, a vehicle to explain public utility financing patterns and problems. Biggest problem of utilities is that it takes more plant investment to produce a dollar of revenue than in general industry. This reflects in capital structure with a large amount of debt. The debt, however, is partially secured by stability of earnings. He cautioned the group that though the past records of utility earnings give prospective investors a guide as to what to expect in the future, the investors are well aware that conditions change and that a rule or formula is most dangerous when it appears to be working best. This can have a direct effect on the success of utilities to secure the tremendous amount of new capital they need during the present growth period.

"Who Buys Our Paintings?" by Dennis H. McCarthy, vice-president of First Boston Corp., provided the group with an easily understood, colorful description of the investment bankers' positions in utility financing. He concluded with the statement: "There is no greater source of satisfaction to me than the knowledge that the two most intense hatreds of the Communist leaders are God and Wall Street."

"Controlling the Art" was a talk on financial stabilization and the Federal Reserve System by Weston F. Volberg, vice-president of the Federal Reserve Bank of San Francisco. Prelude to his discussion was the statement that the Federal Reserve System "is in no sense an agency which alone, and regardless of other factors in the economy, can bring about or maintain financial stability." As a contributor to stability, though, the system helps provide some of the freedom from financial gyrations that is important to all industry. Volberg's talk was a description of the system and explanation of some regulatory tools it has available.

Legal

J. E. Sheeks, Sponsor

Attendance at the legal section meetings was by utility company attorneys, some employed by the companies and others who are retained.

Explaining the lawyer's role in utility financing, Robert J. Cahall, So. Calif. Ed., said the lawyer is a member of a highly skilled team of technicians. His special area of responsibility makes it necessary for him to be familiar with the specialties of other members of the group. In addition he must know how a document is proofread, how certain accounting data were compiled, that assumptions underlie certain certificates and many other related items. His responsibility to the company has to be defined with reference to the opinions he is called on to deliver by the underwriting agreement, but must also properly represent the company's interests in all collateral matters arising in the course of financing.

Harry P. Letton Jr., So. Calif. Gas, told the group that a growing maze of federal, state and local laws in the utility field has stimulated the trend to maintain full-time company legal departments. In his talk on the organization and functions of the legal department, he said the practice of preventive law is an important advantage in having a company legal department. He also suggested that keeping executives informed on important developments is a phase of preventive law and that "legal bulletins" might help do this. The legal bulletin would be a simple, lay-language explanation of recent changes that should be noted. A second help to preventive law suggested by Letton was a monthly meeting of the legal staff, and possibly some department representatives, for the purpose of becoming informed on all activities. The legal staff would also meet with sales and operating departments, for example, explaining laws that influence their activities, and practice preventive law, in effect, by educating personnel outside the legal department.

"Historically, the rule of res ipsa loquitur was an invention of expediency designed to aid a plaintiff prove a case where plaintiff was totally ignorant of the facts and the defendant, because of exclusive control, was the only one in a position to show such facts," B. Z. Kastler Jr. told the group. "Modern courts have permitted plaintiffs to plead and prove specific acts of negligence and then rely on the doctrine (res ipsa loquitur) to fill in the interstices of their cases." Kastler said that the elements of exclusive possession, control and oversight should be literally and rigidly adhered to by courts when the doctrine is being applied in damage suits against utilities. Kastler said: "Courts should be permitted to put plaintiff on his proof in all but those cases which precisely and exactly fit the ancient requirements of the rule and not to permit any inferences raised by the doctrine to be considered by the jury where the defendant has effectively rebutted them."

J. R. Elliott, Pacific Lighting Gas Supply, warned the legal section of a possible trend toward abandonment of common law standards in decisions determining liability of the land owner or occupier for injuries to licensees or invitees. Citing the case of *Gettinger vs Stewart*, which was intended to clarify the California law, Elliott raised the question, based on recent decisions, whether courts tend to base liability upon the general yardstick of reasonableness. "The courts must be careful in assessing heavy damages against the owner or occupier of land, where liability is not clearly and logically shown to be based upon his active negligence."

Milford Springer, So. Counties Gas, described the famous Phillips decision of the U. S. Supreme Court that placed natural gas producers under the jurisdiction of the Federal Power Commission. He also pointed out the hazards apparent in delay of legislation to free independent producers from FPC control because exploration and development incentives must be returned to

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The legal and other problems involved in the defeated sale of Riverside, Calif., electric facilities to California Electric Power Co. were discussed by K. M. Lemon of Calectric. The utility company tried to purchase the city's facilities at the request of a number of citizens, including the mayor and the Chamber of Commerce, after the company announced plans to build a new headquarters and generating station in an area it served. Lemon's talk pointed out the inaccuracies of the opposition's information that led to a three-to-two defeat of the proposal by voters.

Stores

H. W. Swanson, Sponsor

George F. Delury of PG and E started off the two-day stores section meeting with a detailed report on how his company uses material and supplies requisitions as source material for punched cards, which in turn are applied many ways in the complex system necessary to account for items in 13 divisions with an aggregate of 186 substores. From the source material, punched cards are cut to carry: type of transaction, material number, quantity, amount, debit or credit, plant location or item number, job number, division number, substore number, issuing or receiving material, requisition number, current month and year, and batch or list number. Credit requisitions covering items retired from plant also carry: prefix, date of installation and retirement code. The card is then useful for stock records, account and job statements and other accounting reports.

Accounting and control of minor items in stores department operations were discussed by the group under the leadership of C. W. De Voe of San Diego G&E. De Voe said minor items are defined by his company as miscellaneous materials most frequently used in constructing, operating and maintaining the overhead distribution system. In the gas department, the items are those that are impractical for charging costs directly to individual jobs, such as acetylene, welding rods, etc. Minor items are charged to general ledger account Exempt Material, and credited to general ledger account Material and Supplies when placed in bins. Cost of items delivered to operation departments is then charged to Exempt Material, the remainder then is shown as being in bins or on trucks. Minor items are segregated from others in the accounting process and charged by percentage to the number of jobs. The account loading percentages for different types of work are calculated on the basis of 200 jobs completed. Stockrooms have lists of the items included in minor materials classification.

Accounting and physical phases of stock control were presented by C. O. Dice Jr. and D. E. Lowe of So. Calif. Gas. Dice said: "There are several good reasons for effective stock control. The cost of job delay caused by material shortage is one reason. Of interest to the accountant are the costs of obsolescence. When the stock control system is inadequate, inventory investment will undoubtedly be higher than required for effective operation. Possibly the most compelling reason for stock control is the wrath of operating departments when material is not available." With the aid of punched cards, Dice's company maintains a system that shows minimum level (on hand), ordering point, ordering quantity and average monthly issues of the item. Transaction cards are processed once weekly to get a weekly stock status report. Lowe said the company maintains stocks at an arbitrary safety level of six weeks' supply. This resolves maintenance of the level to two decisions: when to order; how much to order. Orders are placed so replacement material arrives from the vendor just before the stock safety level is reached, and order point quantities are placed right on the bins for a running check on the level by clerks, which backs up the weekly stock report.

The use of IBM's medium range electronic data processing equipment to material and supplies accounting was discussed by John W. Dorr of International Business Machines Corp. He said that punched cards will be the primary machine information source for many years ahead, despite the constant introduction of new methods and materials. His information substantiated prior reports from other stores section speakers who told how punched cards were used for various purposes in their operations.

Right-of-Way and Land

Allen L. Cleveland, Sponsor

Utility companies, both private and public, are faced with much additional expense in the years to come as new highways make their appearance under the stimulus of federal aid, and the question of reimbursement for relocation of facilities is still far from resolved, according to K. J. Dierks, PG and E. The U. S. Senate has provided for 50% reimbursement for relocation of facilities in bill S. 1048 in cases where state law requires that the total cost must be borne by the utility but the reimbursements must not exceed 2% of the federal aid apportioned in the state. Bill H.R. 8836 in the House provides for reimbursement to the states if the states have paid for the cost of relocation (in the same proportions as the Senate bill). The two must be reconciled in any final law that is passed—or reimbursement provisions dropped out entirely, as the House has done in prior bills. Dierks said the relocation might be done entirely at the utilities' expense if adequate provision is not made, and at a time when virtually all the companies need the manpower and money for new expansions.

Further information on the growth of relocation problems was presented by T. J. Frost of Arizona PS to the right-of-way and land group. His talk was devoted to possible avoidance or minimizing of relocation problems by careful planning in cooperation with city, county and state highway departments. He reported that the plan is proving highly successful, because it not only reduces costs to the utility, it also saves money and complications for the street and highway planners. In some cases, the utility and the agency acquire right-of-way for each other to expedite construction. Frost said: "We all know relocation problems are here to stay but we can use planning and work with other agencies to keep these problems to a minimum."

Ed Uhlig, Calif. Elec. Power, in talking about the kind of right-of-way needed today, said the modern right-of-way agent is living with the inadequacies and idiosyncrasies of the past while looking into a crystal ball to determine the needs of the future, "in order to give us the protection we need now and will need for years to come." He pointed out many conditions necessary for the ideal easement, past, present and future, and said they should be covered in as many agreements as possible.

"One Particular Right-of-Way Job and Its Complications" by E. M. Osborn, So. Counties Gas, set off group discussion and much reminiscing by the right-of-way agents attending the sessions. The problems faced by Osborn in acquiring the pipe line right-of-way in his topic were many—some serious and some amusing—and illustrated the complexities of acquiring the places where utility facilities will be in years ahead. The group concluded with general agreement that right-of-way settlements with landowners should include considerations of long-range good relations; that it is just as bad to pay too little as too much.

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EMEA Show Automated

From automation controls to tiny wire clamps the more than 7,000 selected invitees to the 8th biennial Electrical Industry Show had plenty to reward their struggle with traffic and parking to see and learn about. Sponsored by the Electrical Maintenance Engineers Assn. of Southern California visitors were invited and selected from among the area's industries. They were maintenance engineers, superintendents, managers, production management, engineers, contractors, architects, purchasing agents and trade school students. All were interested in the newest available products that might meet some need or do a better job than what they were now using.

Exhibitors were highly satisfied for it brought them in touch with selected prospects and a lot of business resulted from the contacts. This year the exhibits were so uniformly excellent and well animated it made difficult selection of the best by the Purchasing Agents Assn. committee for the ELECTRICAL WEST awards. The pictures alongside show the winners. Winners of the school awards by EMEA were California Polytechnic for universities; Los Angeles Trade Technical for first place among junior colleges, Santa Monica, second place, and Fullerton, third.

More comments about some of the unusual devices or exhibits are made in the Contractors' News Letter. The industry advisory board consisted of Walter Heiman, Elmer Lawrence, Paul Mullenbach and F. J. Rohring. Fred J. Tabery Corp. was contractor for the show.

Electrical equipment for industry, most of it new, was exhibited by 93 companies on the Shrine convention hall main floor (top). Kickoff luncheon at Statler Hotel was in charge of Charles Doane, right. Beside him were Charles Hays, show chairman; Edmund McKanna, keynote speaker; Carl Ladenberger, EMEA president. First prize winner of the Electrical West awards for best exhibits was U. S. Motors. Judges were Purchasing Agents Assn. Committeemen Charles Ives, Economy Blue Print Supply; Robert Lassman, Rheem Mfg. Co., chairman; Cecil Guthrie, A. M. Castle Co. Carl Dysinger made Electrical West awards to Morton Hassler, U.S. Motors; to James Reimholz, Clark Controller Co., second prize; and to John Munson, Louis Allis Co., third prize

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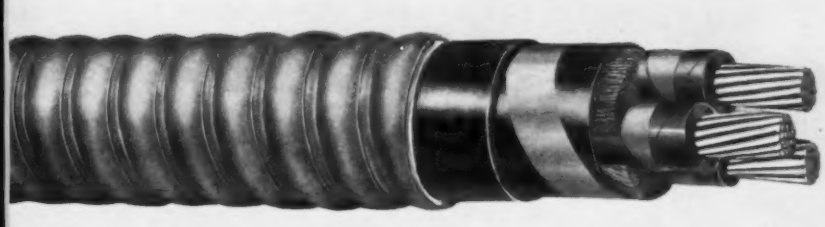

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DALLAS, TEXAS

Electric Water Heater Activity
OHIO POWER COMPANY
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Commercial Electric Cooking Activity
GEORGIA POWER COMPANY
ATLANTA, GEORGIA

Division B—Under 250,000 Meters

Electric Range Activity
METROPOLITAN EDISON COMPANY
READING, PENNSYLVANIA

Electric Water Heater Activity
FLORIDA POWER CORPORATION
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Commercial Electric Cooking Activity
KENTUCKY UTILITIES COMPANY
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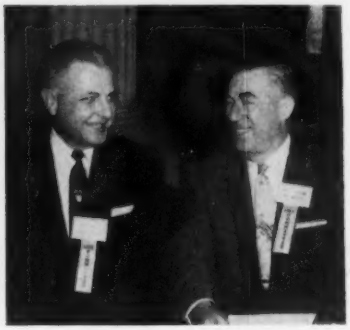


Richey
Sacramento MUD

Friedman
L.A. Dept. of W&P

National regional groups discuss

Public Power Problems

"Our over-all policy in the field of nuclear power fails utterly to recognize the urgency of action to insure our leadership in the field," said Sen. Albert Gore, (D-Tenn.), speaking before the 13th annual convention of the American Public Power Assn. in Los Angeles, April 24-26. He feels that we do not have a national policy in the field of electrical energy that meets the requirements of the times. Gore contrasted the 2,500,000 kw of nuclear power Russia will have by 1960 and the British 10-year plan for 2,500,000 kw with something more than 1,000,000 kw planned in the U. S. The federal government should undertake an atomic power program with a minimum goal of 2,000,000 kw by 1960, declared Gore.

Operating costs are the biggest unknowns in the nuclear power field, said Louis H. Roddis, AEC. J. Z. Holland, AEC, sees no need for worry about contamination if plants are properly engineered and carefully operated. Publicly owned utilities need to participate in technology, cost and availability of atomic power, said James L. Grahl, APPA.

Private power thinks it has some God-given right to provide every kilowatt-hour in the country at rates of their own choosing, charged W. E. Hooper, president, APPA. Alex Radin, general manager, APPA, said public power should disseminate facts broadly to combat the emphasis on taxes being paid by private power.

"The issues before us, at least many of them, represent attacks on all consumer-owned electric systems and point up the need for forming ranks in an organized effort of self-protection and to promote the people's rights in our economy," said J. E. Smith, president, National Rural Electric Cooperative Assn.

Electrical Living

Discussing leisure living electrically, C. C. Walker, vice-president, General Electric Co., said there has been a lack of a united industry-wide promotional approach—the public has not been fully informed of the *benefits* of *electrical living*. What has been needed, he said, was a forthright, consumer-oriented approach that spelled out how our products contribute to better living. Walker said: "Let's eliminate the word 'saturation' from our vocabularies. If we must use a word to describe market potential, let's use the word 'acceptance.' While saturation implies stagnation or the end of the road, *acceptance* is dynamic, capable of being constantly expanded to keep up with the demands of modern living." He told his audience that by giving their full support to the Live Better . . . *Electrically* program they would be educating 160,000,000 Americans to live better electrically.

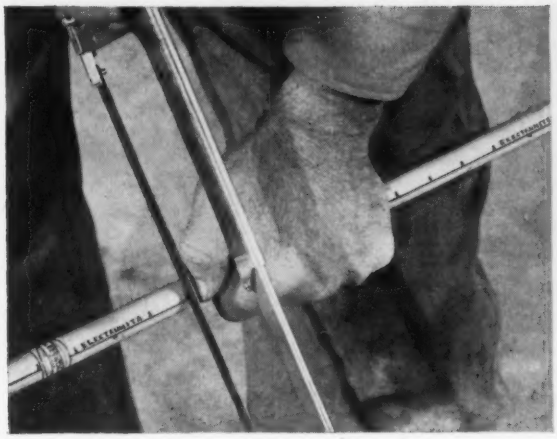
Speaking of planning for the larger residential loads of the future, H. V. Strandberg, chief engineer, Seattle City Light, said: "Numerous studies have been made to determine the economics of higher utilization voltages in residential service. These studies seem to be in general agreement that three-phase, 277/480-v systems have an economic advantage if used in the initial development of medium and high density load areas. This system may find application in large housing projects, some containing as many as 14,000 units. Such an installation would provide much needed information on the adequacy, economy, adaptability, safety and public acceptance of these higher voltages.

"These systems require the use of an autotransformer on the customer's premises . . . The sizing of the autotransformers would be extremely difficult . . . Economic studies . . . must include the installed cost of this autotransformer and its capitalized losses. This may well reduce the possible benefits of higher voltage to insignificance. Public acceptance must be assured.

"Studies indicate that the present

Strandberg
Seattle City Light

Hedrich
Fluor Corp.



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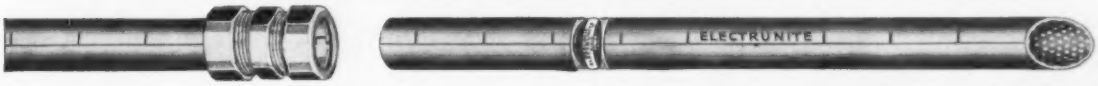

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Resolutions passed called for: the federal government to undertake construction and operation of nuclear power plants and for marketing wheeling of power to preference customers; opposition to changing the holding company act; congressional investigation and legislation to curb private company "political" advertising; to oppose accelerated tax amortization; authorization of national banks to underwrite certain types of revenue bonds; federal construction of the Hells Canyon and John Day projects; creation of a Columbia River development corporation; opposition to sale of falling water to Pacific Gas and Electric Co. from the Trinity River project; integration of this project with the USBR Central Valley Project.

Elected as the next president of APPA was William S. Peterson, general manager and chief engineer, Los Angeles Department of Water & Power. Other new officers include Owen Hurd, Benton County (Wash.) PUD, first vice-president.

Combatalade Sacramento MUD **Criswell** Franklin County PUD

NPPA Meeting

Opposition to private power development at Mountain Sheep and Pleasant Valley on the Snake River was voiced in one of the resolutions adopted by the Northwest Public Power Assn. in convention at Spokane April 11-13. Association officers were authorized to intervene before FPC against the project and reaffirm endorsement of the Nez Perce project below the two private power sites. The association will ask FPC for a moratorium on construction pending studies of multipurpose benefits.

Other resolutions: reaffirm NPPA support of Paradise Dam on the Clark Fork River; urged Congress to define by law the flood control objective for the Columbia basin in terms of upstream storage; opposed the suggested diversion of the Columbia River into the Fraser River basin; and urged FPC to expedite determination of downstream benefits in the Columbia basin.

Alex Radin, general manager, American Public Power Assn., charged that the Potter bill (S. 2643) now before Congress is so broad in its terms that it would exempt from the Holding Company Act such new companies as the Pacific Northwest Power Co (the company formed by four private utilities for new power developments). He forecast a court decision by June on the FPC license to the Idaho Power Co. to build plants in Hells Canyon. Radin said the bill sponsored by Sam Coon (R-Ore.) provides a completely unacceptable method of construction for the proposed John Day Dam.

Dr. William A. Pearl, Bonneville Power Administrator, said that interruptible power will become more important as new federal power plants are completed in the Columbia basin. He estimated that long-term industrial power contracts now proposed by BPA have considerable significance for industrial development, partnership projects and steam plants. Formalizing arrangements for delivering about 680,000 kw of high-quality interruptible power to present industrial consumers will substantially protect an industry investment of about $100,000,000. Pearl said an additional bloc of 100,000 kw of interruptible power will be reserved for new industries. He forecast that supplementing this power with steam generation could allow an industry to establish itself pending delivery of firm power from new projects.

More Storage Needed

Brig. Gen. Louis H. Foote, North Pacific Division, Army Engineers, said that modifications in the 308 program means that only about 50% of the storage needed for the Columbia River system appears probable of development. Fourteen projects now apparently most feasible would provide 10,500,000 acre-ft of storage. He said that Canada is studying storage sites with a possible total of 13,000,000 to 20,000,000 acre-ft. He doubts that Arrow Lakes Dam would benefit U. S. projects but thinks that Mica Creek Dam would be effective.

Harold R. Nelson, regional director, Bureau of Reclamation, Boise, said the bureau is not proposing any Northwest irrigation projects with a financial requirement that would increase the power rate of a participating project. He said that a third power plant at Grand Coulee Dam has been found economically and technically feasible.

Peter C. Spowart, assistant superintendent, Seattle City Light, was elected president to succeed Ora A. Beasley. Seattle was chosen for the 1957 convention.

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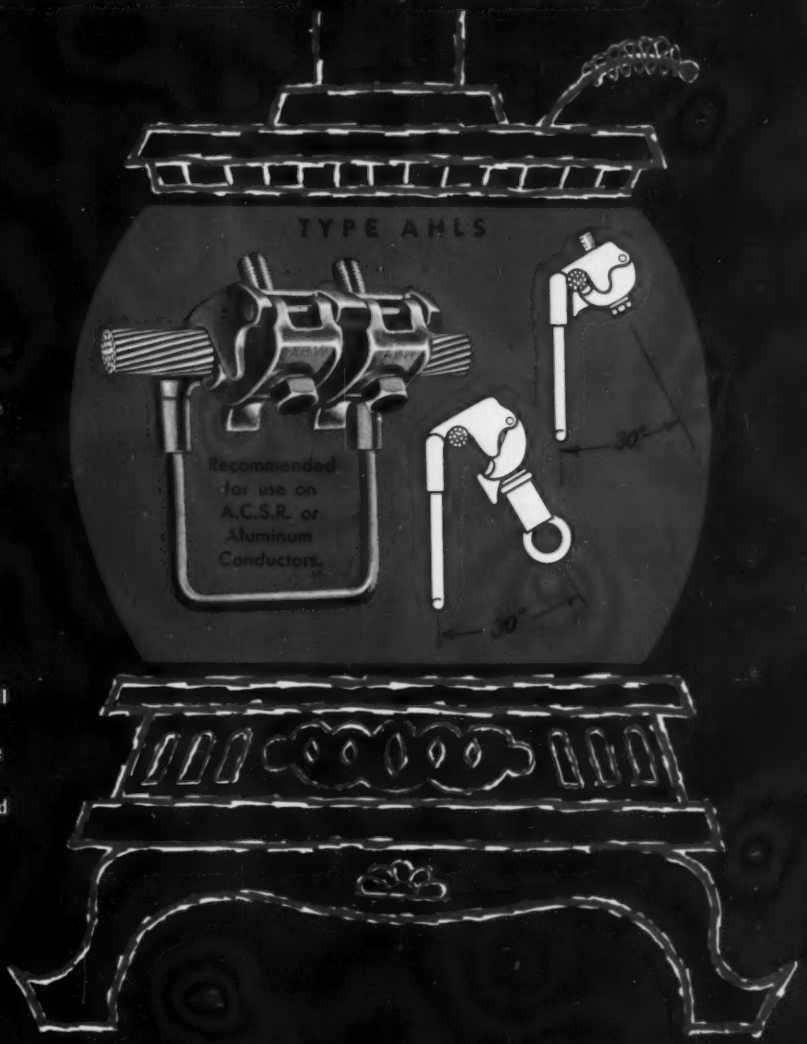

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THIS MONTH'S NEWS

Co-op Members to Sell System to Portland GE

Sandy, Ore., Electric Cooperative members turned down a higher offer for their system from Consumers Power Inc. in favor of a sale to Portland General Electric Co. in two ballots cast in April.

The vote favoring sale to PGE, taken April 25, was 571 yes to 99 no.

Odds against sale to PGE were high, because the cop-op board of directors favored sale to the Consumers cooperative and other public power groups were reportedly encouraging sale to the co-op. PGE, on the other hand, took a position throughout the proceedings that it was a "willing but not anxious buyer," and did not participate actively in promoting the sale.

The system changes hands May 15 for a price of $1,007,300, just $2,800 under the offer of Consumers.

Biggest benefit to the customers of the Sandy co-op will be a reduction of about a third off the average billing, and more in some cases. Another possible benefit is improvement of service "as soon as possible."

U.S. and Canada Parley Set for Columbia Plans

Confirmation of a spring conference in Victoria between federal and British Columbia governments, complementing Canada's recent request for an international power parley with the United States, has raised new hopes for amicable settlement of the Columbia River power development controversy.

It is expected the Victoria meeting will be followed by another parley between British Columbia, Ottawa and Washington. The Canadian government at White Sulphur Springs asked for diplomatic-level U. S.-Canada talks on the Columbia development and for a review of all boundary water-power problems involving the two countries.

Canada has decided to try to lift the stalemated Columbia River problem out of the hands of the International Joint Commission and see if government-to-government talk cannot bring about satisfactory settlement of the problem of evaluation of downstream benefits from upstream storage and of the problem of the Canadian diversion schemes on the Columbia.

Work under way at Tacoma's Mayfield Dam is slowed but not stopped until high court rules

Court Hearings in June On Tacoma's Cowlitz Job

Only one issue is before the Washington Supreme Court on Tacoma's long-contested rights to build two dams on the Cowlitz River. The court must settle the question of whether the stream is navigable. Oral arguments on the question are scheduled for June 25.

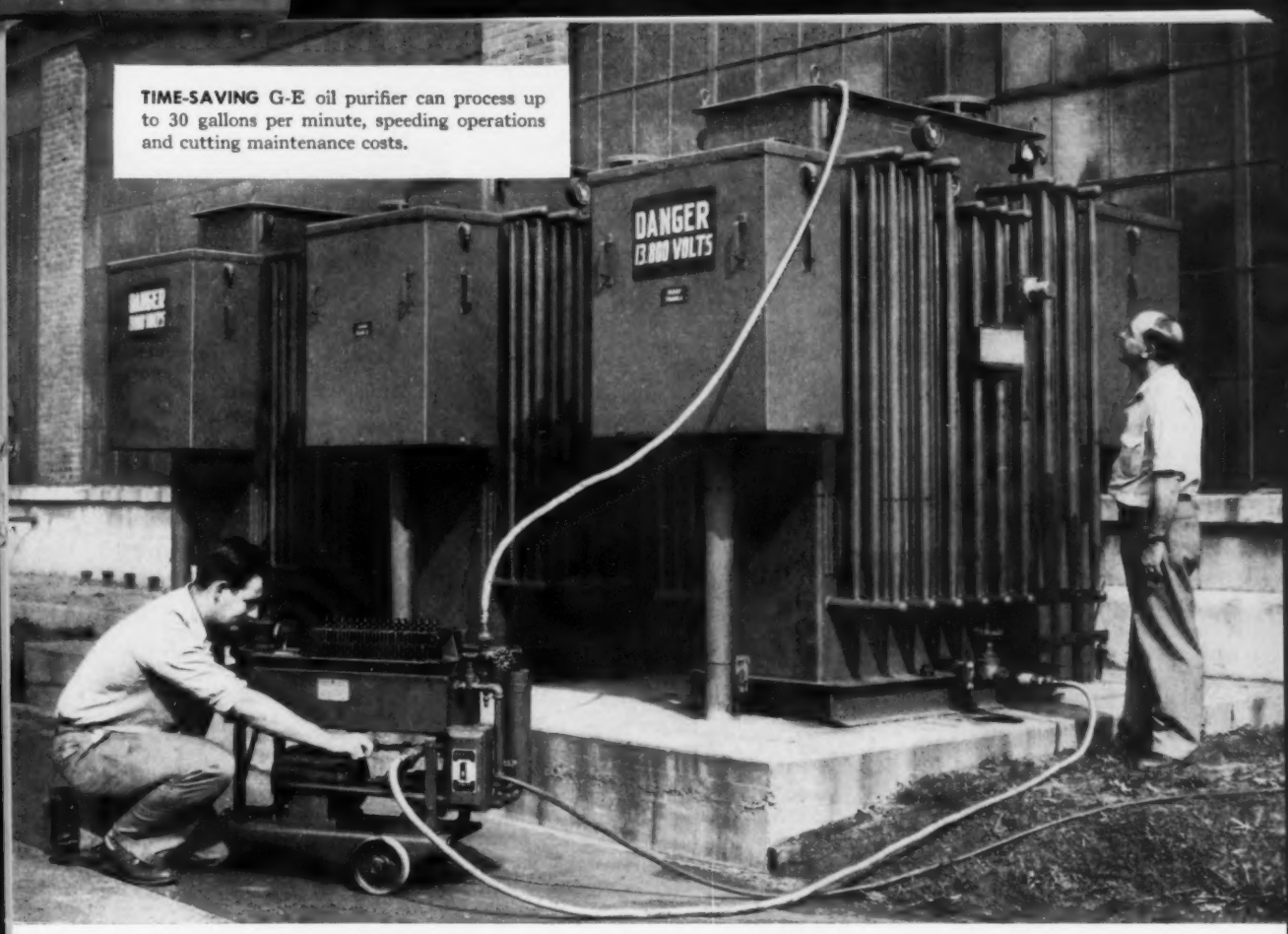
In the meantime, construction is continuing at Mayfield Dam (see photo) on a slowed-down schedule.

A political rift between Gov. Arthur B. Langlie and Attorney General Don Estvold has developed over the project. Langlie declares the project is illegal and Estvold disagrees.

Advance Work on Dikes Started by U. S. Corps

With floods forecast for the Northwest in May and June, emergency bulwarking of lower Columbia River dikes has been started by the Corps of Engineers. A special allocation of $654,500 from U. S. funds is being used for the advance work on 20 specific weak points.

It is possible that crests may be higher than the disastrous 1948 summer freshet of snow melt from the Rockies. However, favorable weather in mid-April was helping to let the runoff down gradually, which could shave the forecasted 25- to 28-ft crest.



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It is important, of course, to filter the insulating liquid when filling a tank for the first time, or when refilling an old tank. Maintenance of dielectric strength is more important today than ever before because many users are ordering transformers with reduced basic insulation levels. If periodic testing indicates a need for filtering, the G-E purifier will do the job, safeguarding equipment life and helping to assure continuous service to customers.

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High-quality Work—Using adequately dried filter paper, you can normally raise the dielectric strength of oil to be reconditioned to 30 kv with just one pass through the purifier.

Easy to Use—Simplicity of operation saves time in training maintenance crews. Unskilled workmen can easily set up and operate G-E purifiers. The single-phase pump motors operate on 115/230 volts, and the filter-paper drying ovens used in conjunction with the equipment are rated for either 115/230 volts or 230/460 volts. Purifiers and ovens can be quickly connected either to single-phase lighting circuits or to one phase of a three-phase circuit.

For More Details—For complete information on low-cost G-E purifiers for oil and Pyranol, drying ovens, and filter paper, contact your nearest G-E Apparatus Sales Office, or write for Bulletin GEA-1333, Section 431-45, General Electric Company, Schenectady, New York.

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Montana to Get Plant At Sidney Location

A 44,000-kw steam plant will be built near Sidney, Mont., by Montana-Dakota Utilities Co. Cost will be approximately $8,000,000, according to Brad Durant, district general manager.

Preliminary operation is expected to begin in the fall of 1958, but installation of coal burning and handling equipment is not expected to be completed until 1960.

The plant will be operated on lignite coal, plentiful in the area. Durant said the plan is based on a recent report by Arthur D. Little & Co. of Cambridge, Mass., consulting engineers, that electric power can be generated on a large-scale basis with lignite coal as economically as hydro.

The Sidney system will be integrated with the company's present system serving eastern Montana, northern Wyoming, South Dakota and western North Dakota.

Partnership for Cougar Bogs Down in Committee

Partnership legislation for Cougar Dam on the south fork of the McKenzie appears buried by committee for this Congressional session. Congress has ordered construction of the dam by the Corps of Engineers and the Eugene Water & Electric Board has offered to finance power phases.

Returning from Washington last month, the utility's attorney, Windsor W. Calkins, reported that the House subcommittee before which the city argued its case appears satisfied to heed Senators Wayne L. Morse and Richard L. Neuberger, who oppose the legislation.

Meanwhile EW&EB directors heard a report from administrative-engineering personnel that defeat of the revenue bond proposal to finance the Beaver Marsh hydro project had signaled halt to all right-of-way purchase.

Public and Private Join In Appeal for U. S. Help

Spokesmen for eight public and private utilities in Washington and Oregon appeared before the House appropriations subcommittee recently to ask for a start on at least one major federal power project immediately.

Specific requests made by the group included doubling the $5,000,000 budget for Ice Harbor Dam, and also the $500,000 asked for John Day Dam. The group generally supported "as a minimum" requests made by President Eisenhower for the Corps of Engineers and Bonneville Power Administration.

Represented in the group were Wahkiakum, Wash., County PUD, Pacific Power & Light Co., Seattle City Light, Eugene, Ore., Water & Electric Board, Portland General Electric Co., Tacoma Department of Public Utilities, Washington Water Power Co. and the Washington State Power Commission. Totaled they serve about 70% of the electrical consumers in the two states.

Ellis Drops His Suit Against Priest Rapids

Paul G. Ellis, an Ephrata contractor, has withdrawn his suit to halt construction of the Priest Rapids project by Grant County PUD, but negotiations for sale of power are still hitting occasional snags.

Seattle's city council has authorized Superintendent Paul Raver to continue negotiations for power from the project, but has objected to a contract provision that purchasers must pay for electrical energy "regardless of interruption or cessation of delivery for any cause whatsoever."

On the other hand, bankers advising the PUD say the provision is necessary to assure sale of the revenue bonds needed to finance the project.

Heco Plans Stock Sale To Cover Expansion Cost

Hawaiian Electric Co. will issue a 70,000-share stock dividend to its common stockholders as part of a series of changes approved at the recent annual meeting.

Stockholders voted to: (1) retain their right to buy new stock issues but authorized directors to set the per share price instead of selling at par; (2) increase authorized capital from $23,000,000 to $31,000,000 by increasing authorized common from $14,000,000 to $22,000,000; (3) authorize the directors to set the sale dates for the balance of the newly authorized common.

It is planned that Heco will sell 100,000 shares of common this year to finance its expansion program and offer $5,000,000 in preferred stock, probably in large blocks to mainland institutions.

• **British Columbia Power Commission** received authorization from the provincial government to build a third 56-mile, 138,000-v transmission line from the John Hart power development on Campbell River on Vancouver Island to its new Dunsmuir switching station.

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WWP Again Dealing for Purchase of Utility

Negotiations are under way for purchase by Washington Water Power Co. of the Deer Park properties of Citizens Utilities Co. of Connecticut. About 2,300 customers are served in the surrounding territory in northern Spokane and southern Stevens Counties.

Deer Park commissioners will consider repealing a recent ordinance authorizing the town to establish a municipal power system so that they can grant a franchise to WWP.

Kinsey M. Robinson, WWP president, said the company expects to ask the state PSC for authority to buy the system and forecasts reduction of 27% in average residential rate.

Richard Rosenthal, president of Citizens Utilities, said his company had been influenced largely by the recent Stevens County vote; that WWP could operate the system for less than its present costs and the sale would benefit residents of the area.

McNary on Schedule After Two-Month Delay

Generator installation at McNary Dam on the Columbia River got back on schedule last month when No. 12 of the 70,000-kw units went on the line. Unit No. 11, delayed more than two months by failure of parts to arrive from English suppliers, went into service just a week ahead of No. 12. Corps of Engineers announced that No. 13 and No. 14 are expected to go on the line on schedule—within 180 days.

Generation neared the 1,000,000-kw level in early April during heavy runoff. Units are running about 15% above rated capacity, the Corps reports.

Tunnels to be Built On Feather in Summer

Construction of tunnels for two new hydroelectric power houses on the north fork of the Feather River will start this summer, according to Norman R. Sutherland, president and general manager of Pacific Gas and Electric Co.

The tunnels are preliminary steps to building Butt Valley and Caribou No. 2 power houses and related works. The two will have a combined capacity of 145,000 kw.

Over-all plans for North Fork development call for an ultimate capacity of 750,000 kw in 10 plants. The first Caribou plant is complete and the Poe project is under way.

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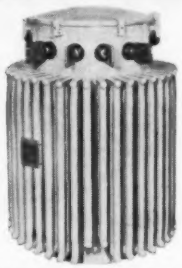

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Snake River Project Delayed Until Fall

Start of construction of Mountain Sheep and Pleasant Valley Dams on the Snake River, originally scheduled for April, has been set back to September.

Pacific Northwest Power Co. officials report that the delay is caused by failure of the Federal Power Commission to hold hearings on issues raised by sportsmen's groups, the National Hells Canyon Assn. and the Farmers Union of Oregon and Montana.

Kinsey M. Robinson, president of PNP, said even further delay is possible if hearings are not held by this month.

Bonneville Offers Pacts For Electroprocess Power

All electroprocess industrial customers of Bonneville Power Administration have received preliminary proposals for long-term contracts for 680,000 kw of high-priority interruptible power.

For assurance of a continuous market for interruptible power, BPA is trying to firm up present arrangements with formal contracts. Another block of 100,000 kw is being reserved for new industries proposing to contract for firm power from nonfederal projects, according to Administrator William A. Pearl.

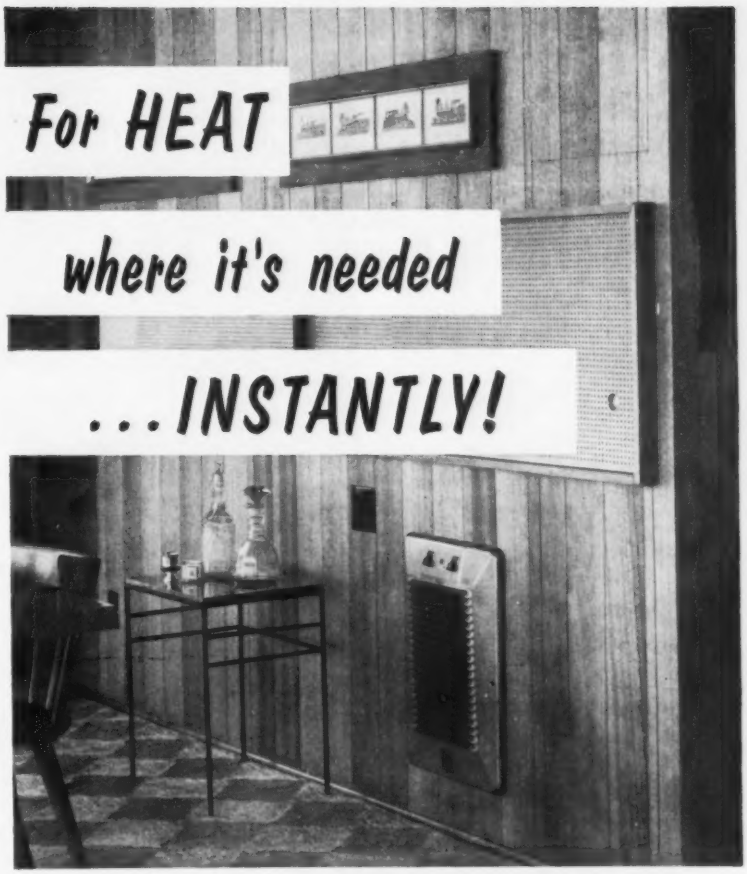
Nuclear Study Planned By Hawaiian Company

Hawaiian Electric Co. has been granted an access permit to obtain classified technical information on atomic power, according to Ralph B. Johnson, administraitve vice-president. It will study the possibility of using a nuclear reactor in a power plant of 50,000 to 100,000 kw. Such a plant on Oahu is far in the future, however, Johnson said.

Payment of Sheridan Tax Protested by Utility

Montana-Dakota Utilities Co. has started to pay a $15,000 annual utility tax to the town of Sheridan, Wyo., but is protesting it.

Across the top of the first two checks were the words: "This payment is made under protest and is not a voluntary payment for the reason the tax is discriminatory and excessive, and the city is not authorized to levy and collect such a tax."



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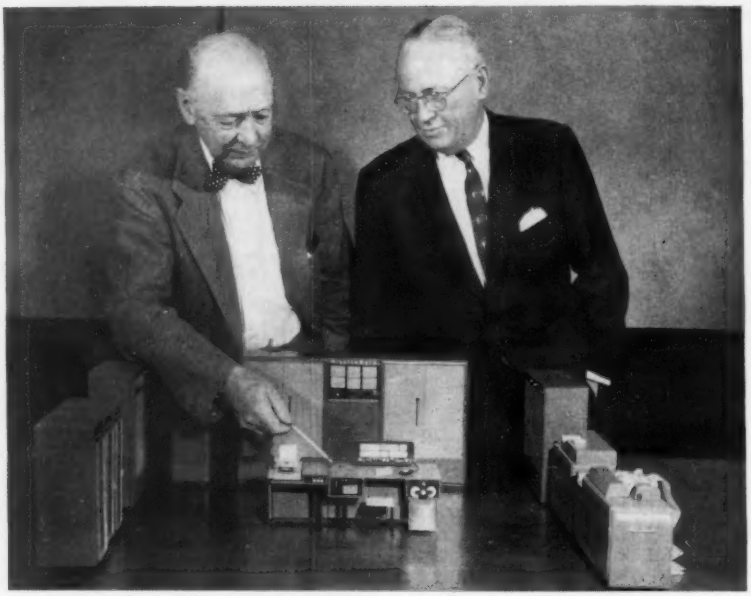

George F. Mackenzie, treasurer; Paul B. McKee, president, with PP&L computer model

Electronic Equipment Purchased by Pacific

After four years of study, Pacific Power & Light Co. has ordered electronic data processing equipment valued at approximately $1,000,000 from Electro Data Corp., Pasadena, Calif., and International Business Machines Corp., according to Paul McKee, president.

McKee said application of the equipment would be for engineering and business data analysis as well as for accounting.

Installation will be complete in about a year.

The computer study was carried on by a team of company personnel and staff members of Stanford Research Institute. It revealed that the installation "will more than justify itself by speeding up routine accounting operations and holding down their cost," McKee said.

Bids and Contracts

• **Bethlehem** and **U. S. Steel** have received contracts totaling $1,026,000 to supply steel sheet piling for Chelan County PUD's Rocky Reach Dam. Puget Sound Power & Light Co. is cooperating with the PUD in construction of the $200,000,000 project.

• **S. Morgan Smith** Co. submitted low bid of $4,258,430 for three 143,000-hp hydraulic turbines for the power house at Ice Harbor Dam on the Snake River. The turbines will be the first of six planned for installation at Ice Harbor by Army Engineers.

• **Bechtel Corp.**, San Francisco, has received the contract for construction of a semiunderground power house on the Feather River for Pacific Gas and Electric Co. The plant is part of the $34,900,000 Poe project.

• **Mann Construction** Co., Redmond, Ore., has received a contract from Bonneville to build a control house at The Dalles substation. Bid was $16,640.

• **F. H. Jarnagin,** Port Angeles, Wash., will clear right-of-way and build access roads for the Sultan-Covington section of the Chief Joseph-Covington 345-kv line. Bid was $139,948.

• **Mannix** Ltd. of Vancouver has received a contract to build the power house in British Columbia Electric Co.'s Cheakamus hydroelectric project. The contract is for approximately $2,500,000.

• **Morrison-Knudsen** Co. has been awarded a $21,000,000 contract for construction of the concrete and earth fill Noxon Rapids Dam for Washington Water Power Co. Work is to start immediately.

• **Aluminum Co. of America** is supplying 145 miles of aluminum transmission cable for Pacific Gas and Electric Co. reconductoring.

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NOTES ON THE TRADE

• **Robert Page** is now plant manager of General Electric Co.'s North Hollywood distribution assemblies plant.

• **Sylvania Electric Products** Inc. has leased 33,000 sq ft of warehouse and office space in Denver at 4700 E. 48th Ave. Products it will now warehouse there include lighting and photolamp products; radio and TV tubes. **James A. Tilson** will be moved from Kansas City to be service manager at Denver.

• **Square D** Co. has started construction of a $400,000 branch plant, warehouse and office in Denver. Initial construction, scheduled for completion in six months, will provide 11,000 sq ft of floor space in a single-story structure. The new assembly plant will be the third in the West, others being located at San Francisco and Seattle. It will assemble distribution and control devices for specialized requirements and will warehouse the manufacturer's standard products.

• **Prescolite Mfg.** Corp. has promoted **Stan Heywood** from sales engineer in the Los Angeles area to eastern sales manager of the company. He will make his headquarters at the Neshaminy, Pa., plant of the company.

• **Harvey Aluminum** has moved Bay Area engineering offices to 2020 Milvia St., Berkeley 4, Calif. New telephone number is THornwall 5-3133.

• **Atomics International**, a division of North American Aviation Inc., will build the first atomic reactor for the Far East. It will be a 50-kw unit for research, and will be located near Tokyo.

• **Harry B. Allan Jr.** has joined **Robert J. Arthur,** manufacturers' representative in northern California and Nevada, and the firm name has been changed to Arthur & Allan. Headquarters are at 420 Market St., San Francisco. Allan formerly was with Ets-Hokin & Galvin.

• **Robert L. Everett** is new Pacific Coast industrial relations manager for the Westinghouse Manufacturing and Repair Division. He succeeds **Charles H. Chance** who becomes industrial relations manager for the Transformer Division, one of the company's largest operations.

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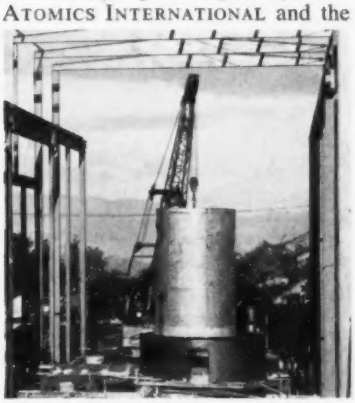
NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

Principal Technical Details of the Sodium Reactor Experiment in California

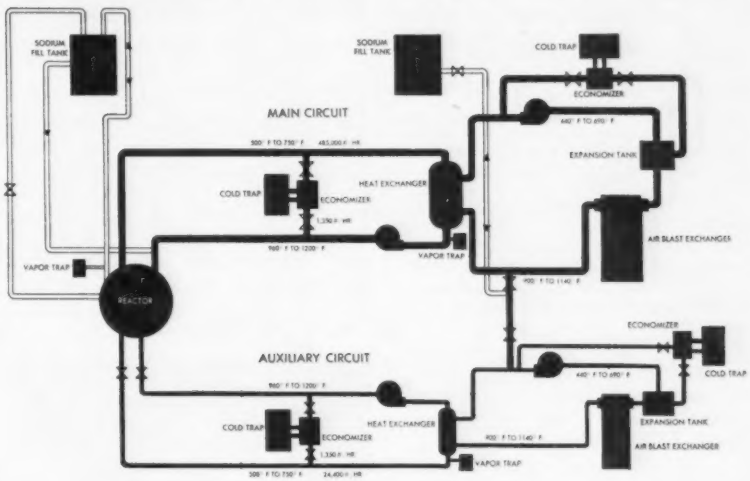
The Sodium Reactor Experiment is an important contribution to the Atomic Energy Commission's program to develop economical power from nuclear energy. Interest in the SRE approach is high. The Atomic Energy Commission has authorized ATOMICS INTERNATIONAL and the Southern California Edison Company to enter into an agreement for Edison to install electrical generating equipment with a capacity of 7,500 kilowatts adjacent to the SRE to convert the reactor's 20,000 kilowatts of heat into electricity which will be fed into the utility's power grid system. ATOMICS INTERNATIONAL and the



SRE reactor core is lowered into place deep in the Santa Susana Mountains

Consumers Public Power District of Nebraska are negotiating for the construction of a 75,000 kilowatt nuclear power plant utilizing a sodium graphite reactor based on SRE experience.

The Sodium-Cooled, graphite-moderated reactor design has many advantages. The use of sodium permits high temperature operation, good steam conditions and high thermal efficiency of power conversion without pressurization of the reactor and coolant circuit. The high thermal conductivity of sodium makes it an excellent heat transfer medium. Sodium boils at 1620°F.—is liquid at 208°F. This permits high coolant temperatures with the system at atmospheric pressure, creating a low-pressure heat extraction system which simplifies reactor construction. Further, the sodium design minimizes chemical reaction between fuel elements, coolants and structural materials—increases safety—allows the use of a variety of steels and alloys in construction.



Sodium Flow Diagram For SRE Cooling System

Nominally Rated Output of SRE with Uranium fuel (enriched with 2.80 atom percent U235) is 20 Thermal Megawatts. The reactor core is made up of fuel rods, moderator cans and control elements interspersed and immersed in sodium coolant. The fuel is composed of 6 inch slugs, 0.750 inches in diameter, formed in 6 foot columns tied in clusters of seven. The graphite moderator elements are canned in Zirconium, fabricated with an axial coolant channel. This prevents absorption of sodium into graphite. Much less costly than beryllium—graphite is also comparatively easy to handle.

Capital and Power Costs in Full Scale Power Stations—At present, with Uranium fuel, capital costs/installed Kw. are expected to total $300. With Thorium, costs may be $265/installed Kw. Power costs (based on 80% load factor and 15% annual fixed charges) may be 11 mills/kwh with Uranium, 9 mills with Thorium. Future costs with Thorium fuel are expected to be $200/Kw capital cost and 6.5 mills/kwh total power costs.

Atomics International is a major reactor builder—experienced in the design, construction and operation of nuclear reactors for research and the production of power. If you are interested in any phase of our activities, ATOMICS INTERNATIONAL is staffed and equipped to help you. Please write: Applications Engineering Service, Dept. ET-N2, ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, California. Cable address: ATOMICS.

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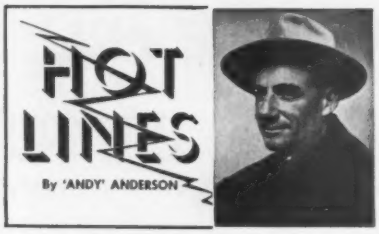
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM



Linemen's Preference . . .

Abbreviations mean different things to different people. "LP," for instance, might stand for "long playing" phonograph records at your house. While to a farmer, "LP" more likely stands for "liquefied petroleum" gas.

Here at A. B. Chance Co., though, "LP" stands for "*Linemen's Preference*," a term we've applied to the hot line tools used most extensively and preferred by most linemen doing hot stick work.

An "LP" list of preferred tools has been compiled by combining the preferences, established in a field survey made throughout the United States and Canada, with the preferences of our own demonstrators who do all kinds of hot stick jobs.

This is valuable information for you men who requisition hot line tools. It will make your decisions a lot easier and the results will be more universally acceptable to your line crews.

The hand tool section of your Chance Catalog is checked to show these preferences, that is, if you have the new sheets. If you don't have these new pages, a post card will get them for you.

Since these pages were printed, however, we've extended the "LP" listings (by popular request) throughout our entire hot stick line. So—to get the complete Linemen's Preference list—return the coupon at the bottom of this column or see your latest copy of "Chance Tips."

Here at Chance, the term "Linemen's Preference" is like a Seal of Approval for hot line tools that have *earned* their rating. The A. B. Chance Co. recommends that you standardize on them in selecting the hot sticks to best serve your linemen.

As many of you know, I'm a "lineman" —not an ad writer . . . which probably accounts for the fact that I've already given you the punch line that should go here. Anyway it will bear repeating, so . . . tear out this coupon and mail it today for the "LP" listing, printed and punched to fit your Chance Catalog.

A. B. CHANCE CO., Dept. 212, CENTRALIA, MO.
Please send me your new list of "Linemen's Preference" Tools.
Name_____
Title_____
Company_____
Address_____
City & State_____
CH56-12

Schanz

• **Leo Schanz,** former associate publisher of **Electric Light & Power** magazine, is joining the design section of General Electric's 180,000-kw nuclear reactor project for Commonwealth Edison. He is moving to San Jose, Calif. Schanz has BA, BS, MS and PhD in mechanical engineering, and has studied extensively the fields of heat transfer and thermodynamics.

Lawton

• **John P. Lawton,** Northwestern district manager for Graybar Electric Co., was made a director of the company recently. With Graybar since 1923, Lawton has been in Seattle since 1945, and has been district manager since 1946. He is a past president of the Electric Club of Washington and active in area NAED meetings.

• **Curtis Lighting** Inc. is now manufacturing lighting fixtures in its recently acquired plant at 242 S. Anderson St., Los Angeles. One of the first shipments scheduled from the plant is to the Federal Reserve Bank, San Francisco.

BRONCO 66
CABLE
POWERS
the
MUSCLES
of
INDUSTRY
WRITE for the complete story of BRONCO 66 CERTIFIED, the dependable, extra flexible, electrical cables through which energy flows to the power tools of industry. These Synchro-Cured portable electrical cords and cables are made with a branded jacket certified to contain not less than 67.32% Neoprene.
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WESTERN INSULATED WIRE CO., Los Angeles 58, California
ASK YOUR ELECTRICAL WHOLESALE DISTRIBUTOR FOR THE CABLE WITH THE 66% NEOPRENE JACKET

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Savolt Engineers, working in the interest of both user and utility, increase efficiency and determine the most economical rate structure. This conserves utilities and results in a saving to the consumer.
NO SAVINGS SHOWN
NO COST TO YOU!
HARBOR 5217
THE savolt CORP.
Calif. Registered Engineering Specialists
503 32nd Street—Newport Beach, Calif.

ATTENTION:
WEST COAST COMPANIES

A publicly owned East Coast manufacturer of rotating electrical equipment would like to acquire or merge with a West Coast company making electro-mechanical or related products. Our organization has top engineering talent, productive field sales force, and quality products — and is seeking to strengthen its position in the growing Far West. Write Box 289, Electrical West, 68 Post Street, San Francisco 4, Calif.

Nicopress

SUSPENSION DEAD END

1 Faster

2 Neat streamline job when completed

3 Can be made with the same tool used in making a regular line splice

4 The exclusive features found in this Dead End make it possible for it to withstand the most severe conditions

5 Dead Ends are available for Copper, Copperweld and Steel

Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and Foreign Countries.

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

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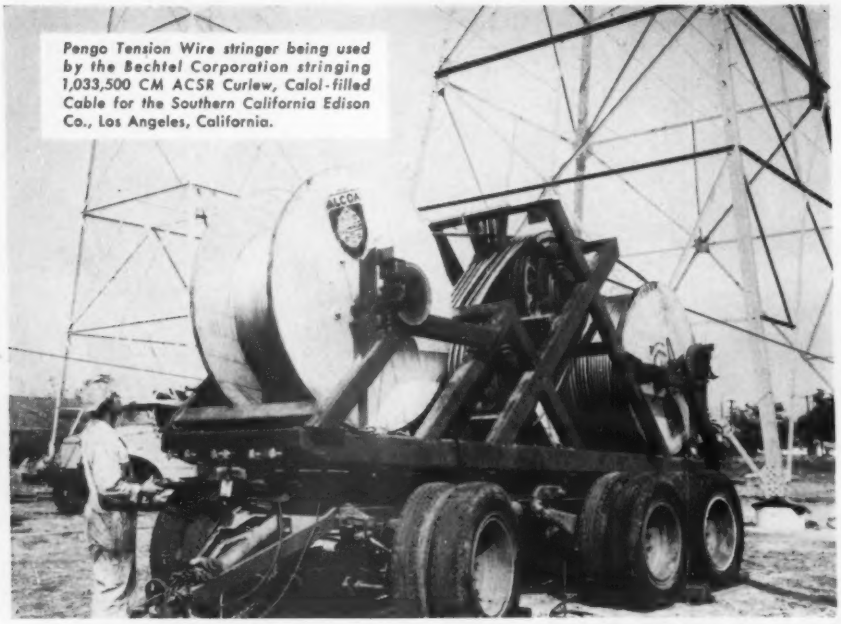
THE NATIONAL TELEPHONE SUPPLY COMPANY



Pengo Tension Wire stringer being used by the Bechtel Corporation stringing 1,033,500 CM ACSR Curlew, Calol-filled Cable for the Southern California Edison Co., Los Angeles, California.

The latest method of stringing conductors

- ***Safest, most economical for transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits... by far the safest, too!***

Operation of the PENGO Tension Wire Stringer is almost unbelievably smooth. Because the tensioning is done on the Neoprene-Lined Bullwheels rather than on reels, conductor damage from the reels has been eliminated entirely. Due to the Neoprene lining of the Bullwheels, it is possible to use a full range of wire sizes to maximum groove capacity, which, in the case of the Model 6000-WS shown in picture, is Pheasant or 1⅜" diameter.

SMOOTH, POSITIVE CONTROL OF CONDUCTOR TENSION can be maintained at all times regardless of model or size of PENGO Tension Wire Stringer used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

In addition to the model shown in the picture, all series are available in low-slung trailer mounts for mountain work with separate easy-loading reel trailers.

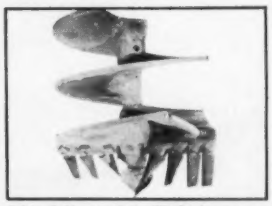
List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO.
Santa Clara, California Dept. 3
Please send me more information on the new Pengo Tension Wire Stringer.
Name_____
Firm_____
Address_____
City_____ State_____

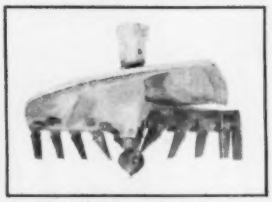
Made by the makers of the World-Famous
PENGO EARTH AUGERS

PETERSEN
ENGINEERING COMPANY
Santa Clara, Calif.

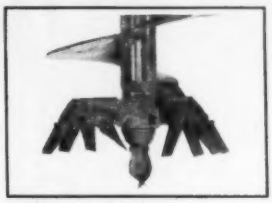
Other PENGO Products include:



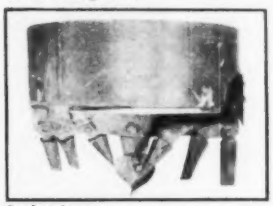
24 inch Heavy Duty Flight Auger



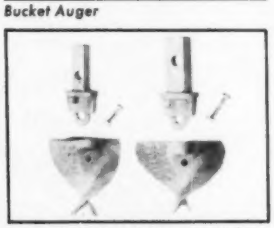
Double-Helix Heavy Duty Auger



Offset Boring Head

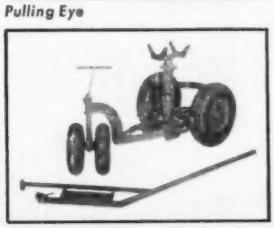


Bucket Auger



Screw Bit for Small Diameter Holes

Pulling Eye



Pole and Transformer Chariot

Pictured is the new West Coast plant of the Reliance Electric & Engineering Co. in Burlingame, Calif. The plant, only recently completed, will be opened officially May 24 by J. W. Corey, president of the motor and drive manufacturing company. Reliance recently purchased the Reeves Pulley Co. in a move to expand service to West Coast industry

• **Guy de Leuze Co.**, manufacturers' representative, has a new address. Since April 2 it has been located at 221 Oak St., San Francisco.

• **H. J. Lenicheck,** Denver distributor of electrical supplies since 1929, announces that he has turned ownership and management of Electric Accessories Co. over to his son, **Herbert W. Lenicheck.**

Flinn

• **Daniel F. Flinn II** has joined American Factors Ltd. as manager of the machinery and electrical departments. Formerly with General Electric Co., Flinn is a member of PCEA, Los Angeles Electric Club and past member of the San Francisco Electric Club and Ben Franklin Club of San Francisco.

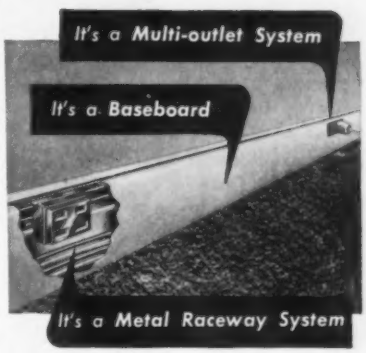
• **J. T. Hill Co.**, San Gabriel, Calif., is Western representative for Non-Linear Systems Inc. States included are California, Arizona and Nevada. The complete line of voltmeters, ohmmeters and luminous readout systems will be represented.

• **John D. Fess,** former Northwest manager for the Okonite Co., has been appointed district manager of the Pittsburgh office. He will be succeeded in Portland by **James B. Caldwell. Edwin R. Conklin** of Portland becomes branch manager at Seattle.

DIRECTORY ADDITIONS

TORK CLOCK CO. INC., 1 Grove St., Mount Vernon, N. Y.
Service Stations:
Fresno: Clock Shop, 1418 Fulton St.
Los Angeles: Allied Industries, 412 Seaton St.
Oakland: Clock Shop, 144 E. 14th St.
Riverside: Brumgardt's Clock Shop, 3795 Orange St.
San Jose: D&S Repair Service, 832-836 Park Ave.
Santa Barbara: Mel-Time Repairs, 20 W. Carrillo St.
San Diego: J. F. Swiener, 1242 1st Ave.
Denver: Mint Time Service, 339 13th St.
Portland: Cobb Watch & Clock Shop, 220 S. W. Alder St.
Ogden: Coray Clock & Appliance Service, 2424 Grant Ave.
Salt Lake City: Time & Instrument Co., 57 Richards St.
Seattle: Abbott Electric Co. 767 Broad St.
Spokane: Harry's Electric Clock Hospital, 175 S. Post St.
Cheyenne: Schmitt's Jewelry, 614 21st St.

NEW
The BIG NEW IDEA in wiring and rewiring
3-in-1
PLUGMOLD BASEBOARD



2200 Plugmold Baseboard is a *brand new* companion to Wiremold's famous multi-outlet and wiring raceways. It is a combination raceway that serves as a multi-outlet system, a wiring system and a steel baseboard . . . *all three in one.*

2200 Plugmold Baseboard is the *modern answer* to all residential, commercial and industrial building wiring and rewiring problems. It reduces rough-in wiring to a minimum, and saves installation costs.

2200 Plugmold Baseboard supplies duplex outlets every 30" or 60" and has a capacity of 10 No. 10 or 3 No. 6 conductors. It can be installed in homes, apartment buildings, offices, stores, showrooms and is ideal for factory assembly line or perimeter wiring.

2200 Plugmold Baseboard meets *all* NEC requirements and is listed by Underwriters' Laboratories, Inc.

For information, Write Dept. L-5

The WIREMOLD Company
HARTFORD 10, CONNECTICUT

SUN-PLI *a new line of laminated insulating materials for Class "A" and "B" operating temperatures*

SUN-PLI insulations offer these four improvements over current laminated types:

- high dielectric properties
- increased moisture resistance
- heat stability
- better mechanical strength

Electro-Tech's new SUN-PLI insulations consist of a polyester film bonded with a heat-resistant laminating adhesive to rag paper, kraft paper, treated asbestos paper and varnished glass cloth. They are suitable for use at both Class "A" and Class "B" operating temperatures as sheet and slot insulation, coil and relay insulation, and motor and dry-type transformer insulation.

SUN-PLI Rag for Kraft tri-ply and duplex combinations offer excellent forming properties as slot insulation.

SUN-PLI Varnished Glass combinations offer increased dielectric properties and protect against loss of dielectric strength from forming.

SUN-PLI Asbestos paper combinations provide improved mechanical and electrical strength plus high moisture resistance.

Available as Duplex (SUN-PLI film bonded to a single sheet of material), Tri-ply (SUN-PLI film bonded to both sides of the same or different material) and Triplex (SUN-PLI film sandwiched between similar or different materials) in sheets, tapes or 36-inch-wide rolls.

Tri-State Supply Corporation
Los Angeles—San Francisco—Seattle

A Division of Sun Chemical Corporation

Electro-Technical Products
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Indiana Steel & Wire Co. Muncie, Ind. — Crapo Galvanizing

Signs along the lines of *Crapo* GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

for LIGHTING SIGNS

One Fixture Cost . . . One Installation Cost

NEO-RAY **ROTO-STRIP**
C.S.A. APPROVED Pat. Pend.

Indoors or outdoors . . . Roto-Strip is ideal for lighting signs. Illustration shows 5-light floor mounted and 3-light ceiling mounted Roto-Strip beaming light at sign from all angles.

This complete shallow unit (available for surface, corner or recessed mounting) has built-in recessed roto sockets that swing 90° in all directions through a complete 360° circle . . . and stay put at any angle. Available in stock sizes of 2'-3'-5' and 8' lengths.

Surely Roto-Strip has a place in your plans.

California Nevada — Robert J. Arthur, 420 Market St., San Francisco 11, Calif.

Mfrd. by: NEO-RAY PRODUCTS, INC., 315 E. 22nd St., New York 10, N. Y.

NEWS ABOUT PEOPLE

Arizona Sales Personnel In Series of Promotions

Four changes have been made in the Arizona Public Service Co. general sales department.

Al Tudor, retaining the title of public information manager, has been named to fill a new position with responsibility for the utility's advertising sales promotion, publicity, publications, art and production, and special services functions.

Sherman R. Payne, former advertising copy supervisor, was named sales promotion and advertising manager, replacing Jackson Hoagland who resigned recently.

Jack Swift, former publicity man, was promoted to publicity manager, replacing Tudor.

Bill Hope, formerly special publications supervisor, was named publications manager, heading up the expanded duties of the publications section.

• **Howard N. Walters,** general sales manager of British Columbia Electric, retired late in March. He is a past president of the Vancouver Board of Trade, and past chairman of the Metropolitan Health Committee and Northwest Electric Light & Power Assn.

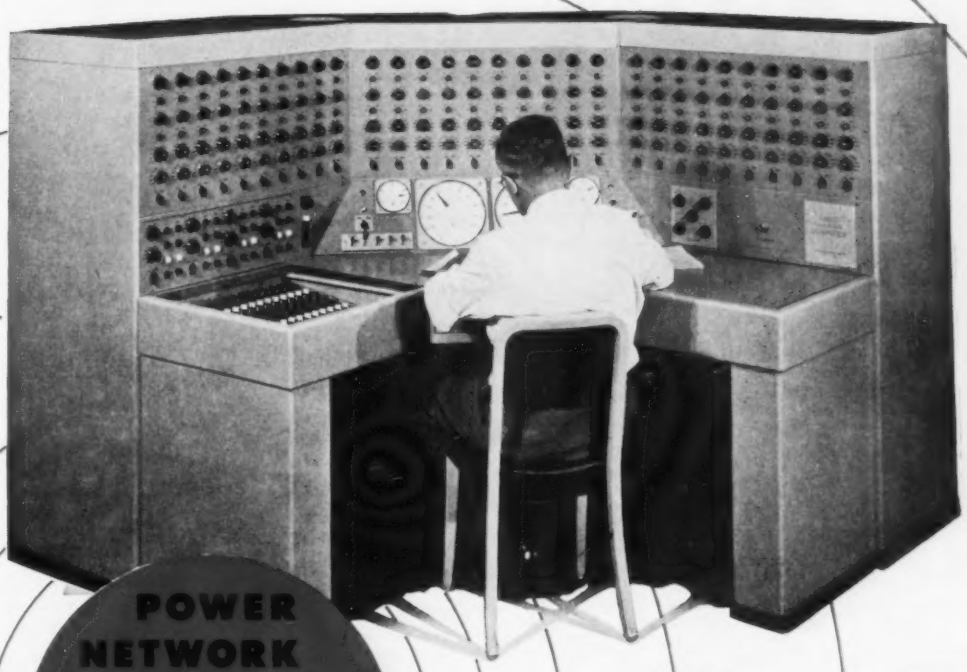
• **Harry S. Dorman,** recently retired as Oregon's first director of the Department of Finance and Administration, has been appointed assistant administrator of Bonneville Power Administration. He will be in charge of procurement, contract and management programs.

• **Daniel J. Torrance,** assistant to the president of Puget Sound Power & Light Co., was honored with a party after announcing his retirement. He joined the company in 1925 and has had his position as assistant to the president since 1930.

• **W. C. Mainwaring,** vice-president and assistant to the president of B. C. Electric Co., has been named president of Western Development & Power Ltd., a subsidiary company formed by the B. C. Power Corp., parent of BCE, to bring in new industry. John C. Ingram, for 10 years Ontario supervisor of the Industrial Development Bank, will be director of industrial development.

Mainwaring's service dates from 1911.

PLANNING *to outguess the future?*



POWER NETWORK PROBLEMS
Solved
quickly, accurately

"Because systems tend to progressive complexity as they grow with the load, analyzers have become necessary to facilitate the planned synthesis of a system. They help clarify and increase the understanding of the relation between the parts of an integrated system and their relation to the performance of the whole. Without analyzers, systems would grow into economic and technical monstrosities, because the work and time required to arrive at satisfactory quantitative conclusions would be prohibitive."

excerpt from house organ of one of the nation's largest electrical firms.

Enns

ENNS POWER NETWORK COMPUTER

30 BUS COMPUTER
sizes to 70 busses . . .
the only board with combined facilities for AC and DC studies in one unit.

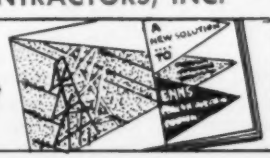
NOW . . . for the first time . . . a low cost power network analyzer specifically designed for the power industry.

One man can accurately and rapidly solve —

- **✓ AC load flow and voltage regulation problems.**
- **✓ DC load flow problems.**
- **✓ Three phase faults.**
- **✓ Single and two phase faults to ground.**
- **✓ Transformer tapping problems.**
- **✓ Any study capable of solution on a DC board.**

ELECTRONIC CONTRACTORS, INC. • 2205 East Burnside Street • Portland 15, Oregon

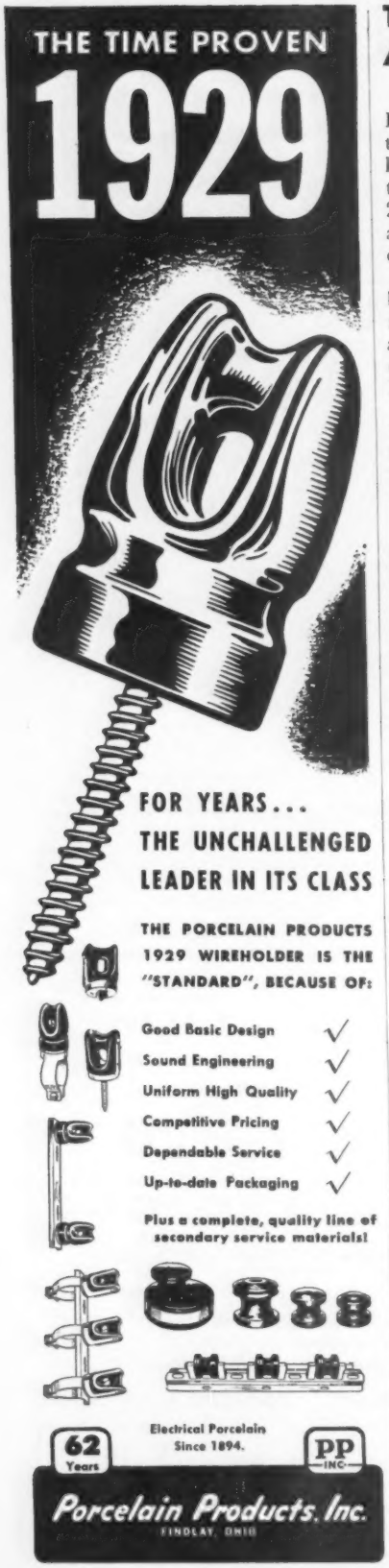
Send for Detailed Brochure



Name_____ Title_____

Firm_____

City_____ State_____



Torpen Joins PP&L As Hydro Engineer

Bernhardt E. Torpen has joined Pacific Power & Light Co. to work on the company's active and proposed hydroelectric projects. He comes to the company with a background of 23 years with the Corps of Engineers and wide experience on multipurpose dams.

Other personnel changes announced by the company include the appointment of William Orren Brownson as administrative assistant to Vice-president John Dierdorff, and Walter Eschebeck as training director.

Brownson is owner of Brownson Distributing Co., Portland, and Eschebeck was formerly a teacher and businessman in Fresno, Calif., and The Dalles respectively.

In district changes, PP&L has moved E. G. Richards to Albany as district office manager; Keen Atwood to Walla Walla district manager; William Scholtes to office manager at The Dalles.

• **Everett Babcock,** a relayman for Salt River Power District, was recently named 1955's outstanding apprentice of Arizona by the Phoenix Industrial Council.

• **A. E. Grauer,** president of British Columbia Power Corp., was elected to the board of directors of Dominion Bridge Co.

• **Harold Quinton,** president and director of Southern California Edison Co., has been elected a director of Kaiser Steel Corp.

• **Dr. Allen M. Peterson** has been chosen to head up Stanford Research Institute's new special techniques group. He will continue devoting part of his time to Stanford University where he is an assistant professor of electrical engineering.

• **Jackson Hoagland** has resigned as sales promotion and advertising manager of Arizona Public Service Co. to take a job with American & Foreign Power Co. in New York.

• **Col. Wendell P. Trower** has been appointed assistant to the vice-president of Kaiser Engineers Division of Henry J. Kaiser Co. He comes to the company from the Corps of Engineers.

• **Clarence P. Komers,** Havre, Montana Power Co. customer service advisor, has been named supervisor of residential sales for the company.

• **Corps of Engineers** Portland district has named **Roy M. Cami** project engineer for the Hills Creek project and **Frederick E. Drager** project engineer for the Cougar project.

• **J. Norris Pearson** is a new chief mechanical engineer for Tacoma City Light, succeeding **Francis H. Murray** who has accepted a position in Denver. Pearson was formerly project engineer with Ebasco Services Inc.

Deaths

• **Sterling M. Gardner,** 70, founder of Gardner Electric Mfg. Co., died late in March following a heart attack. He moved to Oakland, Calif., as a boy and established his transformer plant there in 1909. In 1954 the company was purchased by Federal Electric Co. and now operates as Gardner Transformer Division. As a youth, Mr. Gardner became interested in radio and was awarded one of the world's first amateur licenses. During World War II he was a member of the nation-wide "ham" network. His company designed the first neon sign transformer to be UL approved and wound the coils for the first cyclotron.

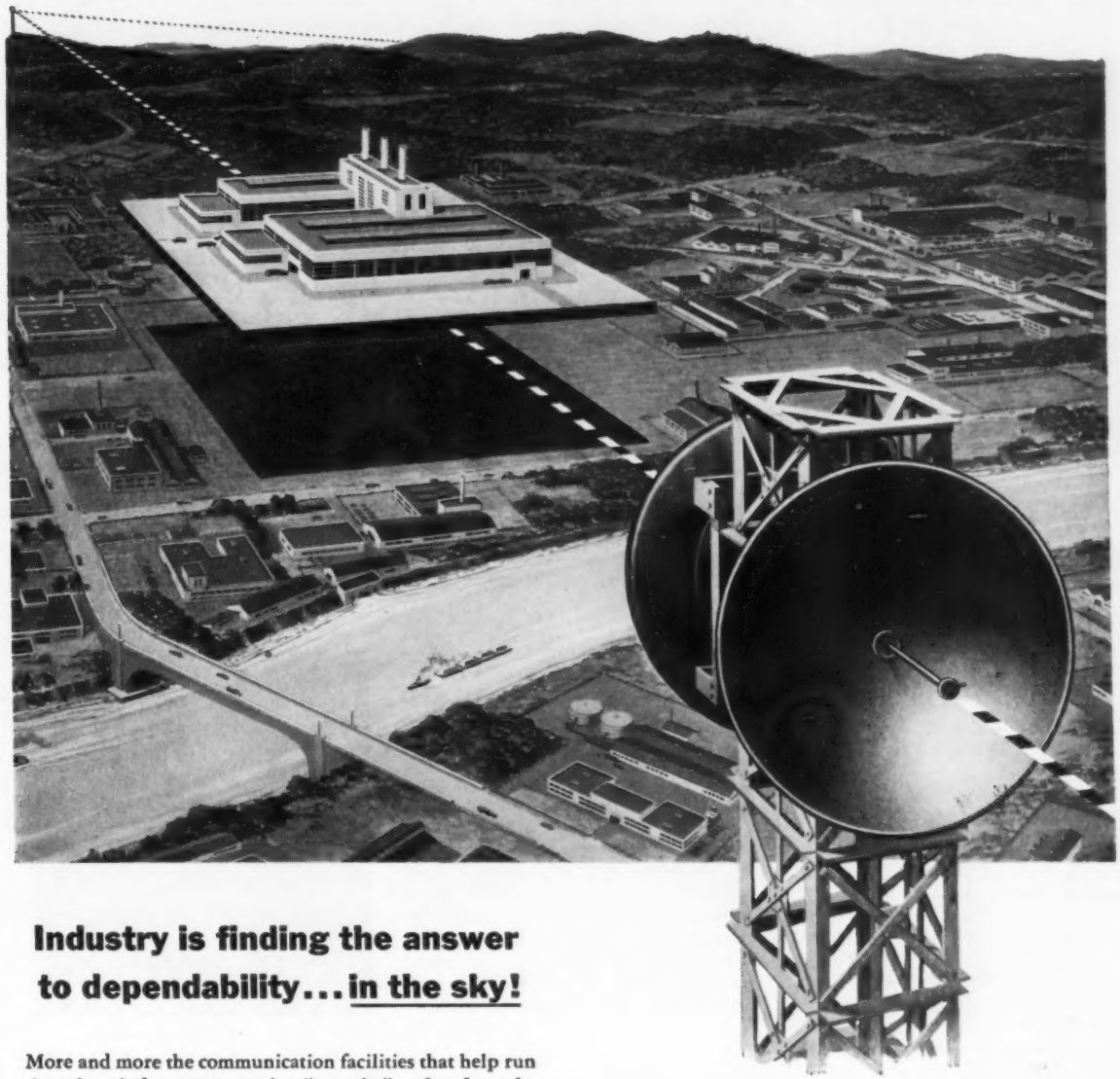
• **Hugh H. Lenhart,** 58, chairman of the board of Cheyenne Light, Fuel & Power Co., died April 8 of a heart attack. Mr. Lenhart was employed by Public Service Co. of Colorado, parent of the Cheyenne utility, in 1923. He headed utilities at Sterling, Alamosa and Grand Junction before he was transferred to Cheyenne in 1940 as vice-president and general manager. He became board chairman in 1955.

• **Floyd George Manring,** Seattle branch manager for the Electric Storage Battery Co. since 1931, died April 16 at age 63. He was with the organization in San Francisco before he moved to Seattle in 1920.

• **George L. Meagher,** 72, retired City Light warehouse superintendent, died in Seattle on April 15. He retired in 1954 after 50 years with City Light.

• **William R. Bowler,** 55, San Jose Division manager for Pacific Gas and Electric Co. and a member of the organization since 1919, died as a result of burns suffered in a suicide attempt April 7. In ill health, Mr. Bowler short-circuited a 60,000-v breaker at the Campbell substation with a chain he looped around his neck. He had been San Jose manager since January 1954 when he was transferred there from Colgate.

FEDERAL MICROWAVE—"*CERTIFIED BY A WORLD OF RESEARCH*"



Industry is finding the answer to dependability... in the sky!

More and more the communication facilities that help run American industry are moving "upstairs"... free from the hazards of blizzards, hurricanes, floods, and fires... the high cost of repair and replacement... the loss that goes with every crippling storm.

The virtually indestructible chains of miles-apart towers that provide industry with microwave circuit pathways in the sky are matched by the *quality* of their service ... the versatility, flexibility, and dependability of multiplex and RF elements in a well engineered microwave system.

Federal Microwave equipment ranks at the top on all these points. It is microwave at its simplest and best... incorporating the techniques and design features developed in many countries by microwave specialists of International Telephone and Telegraph Corporation... *first* to bring commercial microwave to the world!

The records of high reliability achieved by *Federal* Microwave in all-purpose industrial communication is proof that today's soundest microwave investment is the system that's *"Certified by a World of Research!"*

Federal

A DIVISION OF I T & T

Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

100 KINGSLAND ROAD • CLIFTON, NEW JERSEY

In Canada: Standard Telephones and Cables Mfg. Co. (Canada) Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., New York

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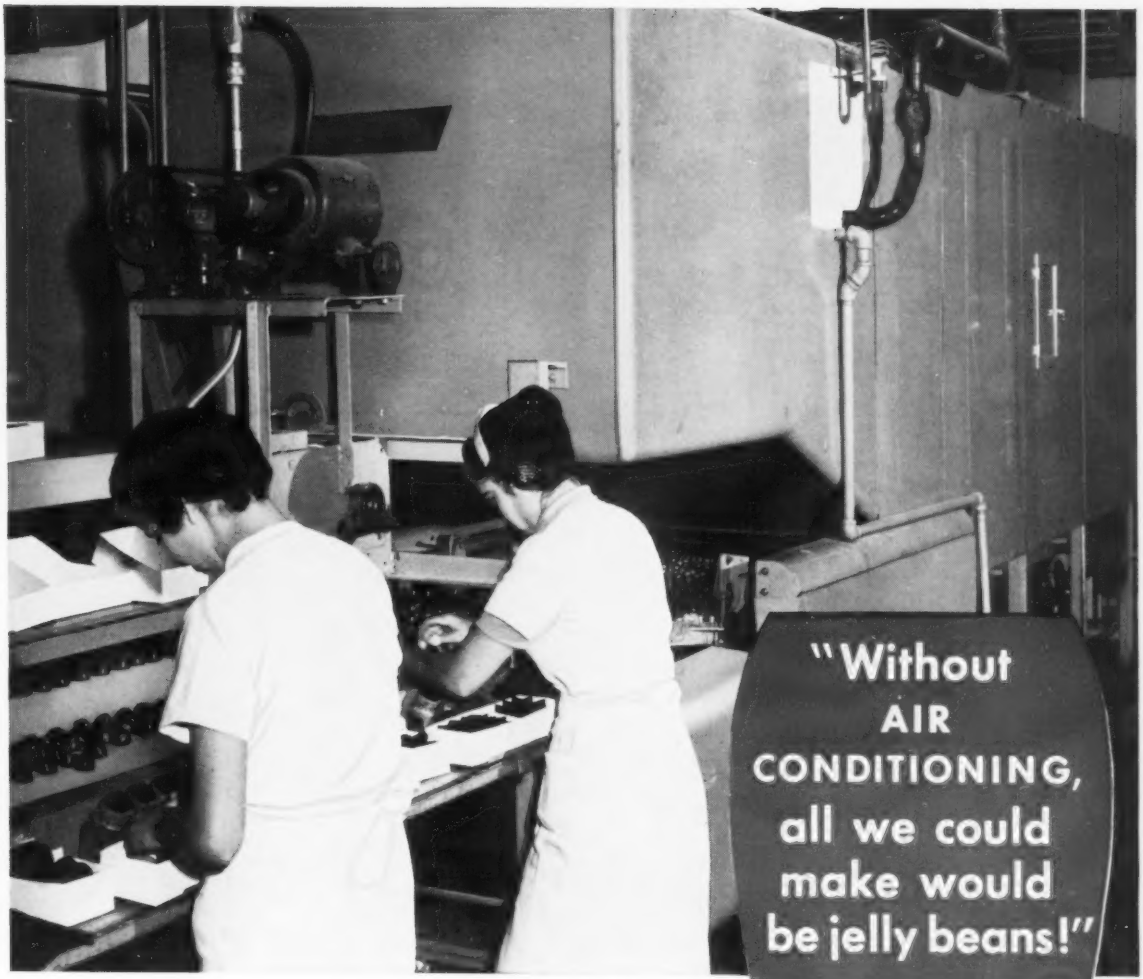
PROFILES

George A. Dickie, 86-year-old Vancouver electrical worker, recently dedicated a British Columbia Electric Co. substation named for him. Before retirement in 1945, Dickie served 56 years as lineman, arc trimmer, armature supervisor and mechanical superintendent, with service dating before origin of B. C. Electric. Substation cost $1,620,000

Al Tudor, with 13 years behind him in public information work with Arizona Public Service Co., has been given new duties that include responsibility for the utility's advertising, sales promotion, publicity, publications, art and production and special services activities. The new position carries his same title, Public Information Manager

Relaxing at the Royal Hawaiian Hotel in Waikiki after a cruise to the islands are Mr. and Mrs. William M. Hogue and their daughter Elizabeth. Hogue is a partner of the Larsen-Hogue Electric Co. The visit included an extensive exploration tour of the island



"Without AIR CONDITIONING, all we could make would be jelly beans!"

—says Manager of the West's largest candy factory

Air conditioning adds a finishing touch to chocolate covered cherries at the Tuxedo Candy Co., San Jose. The cherries are coated with molten chocolate, which solidifies during a trip through the air-cooled tunnel at right.

As supplier for Safeway Stores, the Tuxedo Candy Company of San Jose turns out 100,000 pounds of candy a day. "And we need air conditioning every step of the way," says Manager W. D. Davies. "Without it to cut down on heat and humidity, chocolate wouldn't set, marshmallows wouldn't jell, hard candies would turn sticky. In fact, just about all we could make would be jelly beans!

"So air conditioning is a *must* with us — and we're able to use it at a very moderate cost."

No matter what you manufacture, air conditioning can be a mighty sweet money-saver. It boosts quality and output. Cuts down on rejects. Keeps your plant cleaner. Reduces employee absences from illness. And thanks to P. G. and E.'s low rates, it does all these jobs cheaply.

Want advice on the type of air conditioning that's best for *your* plant? Just contact your consulting engineer or contractor. Or call your local P. G. and E. office for help in solving your particular problem.

Gas and Electricity are cheap in California!

P·G and E·
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There is Sales power in Housepower!

If ever you had a profitable package to push, the one labelled "Housepower" is it!

"Housepower" *is* a package, you see . . . a simple way for the average home to buy the electrical service facilities needed to meet the growing availability of electrical aids to better living. No need to go into lengthy details on the necessary circuits, outlets and switches required for living satisfaction. No need for hard-to-explain specifications and technicalities. "Housepower" is easier to say . . . and easier to sell.

It is your business if you want more business. Once you have sold it, "Housepower" makes your appliance selling job far easier. It adds strength to one of the most effective phrases in the electrical sales lexicon: "Just plug it in!"

"Housepower" promotion is one of the important activities developed and carried on by this Association for the good of the entire electric industry. Contact either of our offices for full information without cost or obligation.

Pacific Coast Electrical Association
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